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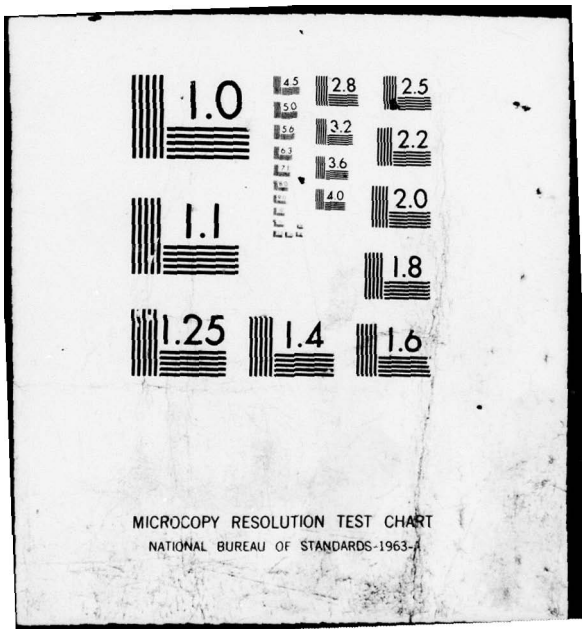
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SILVER LAKE RESERVOIR
RICHMOND COUNTY, NEW YORK
INVENTORY NO. 60

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

NEW YORK DISTRICT CORPS OF ENGINEERS

SEPTEMBER 1978

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO. / 3. RECIPIENT'S CATALOG NUMBER
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Visual Inspection
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Silver Lake Reservoir
Richmond County
City of New York
Water Supply System

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

Silver Lake Reservoir Dam was judged to be safe.

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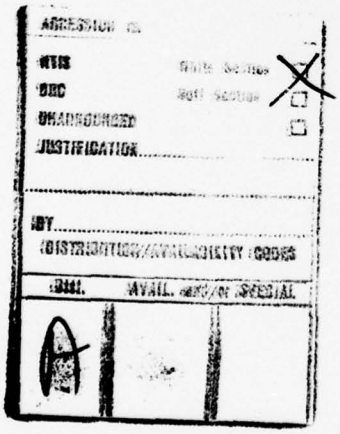
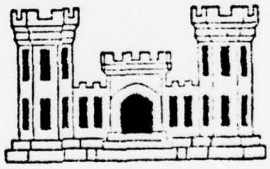
SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

SILVER LAKE RESERVOIR

RICHMOND COUNTY, NEW YORK
INVENTORY NO. 60

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM





Prepared by: TIPPETTS-ABBETT-McCARTHY-STRATTON

NEW YORK DISTRICT CORPS OF ENGINEERS

SEPTEMBER 1978

SILVER LAKE RESERVOIR
INVENTORY NO. 60
PHASE I INSPECTION REPORT

CONTENTS

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	SILVER LAKE RESERVOIR (I.D. NO. 60)
State Located:	NEW YORK
County Located:	RICHMOND
Date of Inspection:	AUGUST 17, 1978

ASSESSMENT

Although the Silver Lake Reservoir project has been neither maintained no operated and virtually abandoned since 1971, examination of the available documents and visual inspection of the project features did not reveal conditions which are unsafe at the present time. The general condition of disrepair and neglect is not considered to be desirable and could, at some future date, affect the safety of the project as a result of further deterioration.

The storage capacity within the reservoir, between the spillway crest level (El 229.3) and the top of the perimeter dikes is conservatively estimated to be equal to 185 percent of the total 6-hour Probable Maximum Precipitation of 19.5 inches over the entire watershed area of 158.4 acres. On this basis the project facilities are considered adequate from a hydrologic viewpoint.

No remedial measures are required at the present time. Certain measures, however, are recommended as follows:

- Repair and maintain the general condition of the gate house structures. (i.e. remove debris, replace the windows with solid sturdy vandal resistant panels, repair and maintain access ladders, platforms, electrical lines, lights, etc.

- Repair and maintain, as required to operate manually, the low level outlets.

- Maintain in a clean and operable condition the waste weirs, the weir chambers and overflow wells.

- Replace corroded tie rods in the valve chamber.

- Heavy brush, shrubs and young saplings should be removed from all locations on the embankments.

- Establish a program of periodic inspections.

- Prepare an operation and maintenance manual for the project.

- Monitor periodically the wet areas on the downstream slope and at the toe of the North Dike.

Eugene O'Brien, P.E.
New York No. 29823

Approved By: Col. Clark H. Benn
New York District Engineer

Date: 2 OCTOBER 1970

OVERVIEW OF MIDDLE DIKE

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
SILVER LAKE RESERVOIR, INVENTORY NO. 60
RICHMOND COUNTY (STATEN ISLAND)

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Phase I Inspection reported herein was authorized by the DEPARTMENT OF THE ARMY, NEW YORK DISTRICT, CORPS OF ENGINEERS by letter dated 31 March 1978, in fulfillment of the requirements of the National Dam Inspection Act, Public Law 92-367, 8 August 1972.

b. Purpose of Inspection

The purpose of this inspection and report is to investigate and evaluate the existing conditions of subject dam in order to: identify deficiencies and hazardous conditions; determine if they constitute hazards to human life or property; and notify the State of New York of these results along with recommendations for remedial measures where necessary.

1.2 DESCRIPTION OF THE PROJECT

a. Description of the Dam

The Silver Lake Reservoir, roughly rectangular in shape and about 2400 feet long and 1200 feet wide, consists of two basins separated by a dividing dike called the Middle Dike. The western boundary of the north basin is formed by the North Dike; the south basin is bounded on the west and south by the West and South Dikes respectively. All embankments are zoned; the upstream zone is of impervious material to El 235 and the downstream zone is of random fill. The top of the North, West and South Dikes, according to the post construction drawing, is at El 238. The North Dike is provided with a 30 ft deep cut off trench, which has a 385 ft long concrete core wall into rock. The upstream slopes of all perimeter dikes are covered with riprap below El 233.

The downstream slope of the North, West and South Dikes are incorporated into the Silver Lake Golf Course which is operated and maintained by the New York City Parks Department.

The Middle Dike separating the north and south basins is constructed of homogeneous impervious material faced on each side with eight inch thick concrete panels; the panels are approximately 8.5 ft wide.

The top of the Middle Dike is at El 233.

Flow to and from the reservoir can be regulated at a gate house located at the center of the Middle Dike. When the Silver Lake reservoir was operational as part of the New York City water supply system feeding the Borough of Richmond (Staten Island), normal regulation of inflow and outflow was managed using five 48 inch gate valves leading to a common header; these valves are as follows:

(1) Inlet gate valve, from Catskill water aqueduct

(2) Inlet-outlet gate valve to North Basin

(3) Inlet-outlet gate valve to South Basin

(4) Outlet gate valve to Richmond Conduit

(5) Outlet gate valve to South Conduit

A 36 inch x 60 inch sluice gate is located on the reservoir side of each inlet-outlet gate valve; the invert of the gate is at El 193.

In addition to the inflow-outflow regulation above, there exists for each basin a 36 inch gate valve operated low level blow-off (invert El 186.5) and a 85 inch wide waste weir (Crest El 229.3), located in the gate house. A 30 inch x 42 inch sluice gate is located on the reservoir side of each blow-off gate.

The 48 inch and 36 inch gate valves could be operated either manually or by electric motor from gate operating stands located in the operating chamber (Floor El 218) of the gate house; sluice gates were manually operated from the top-of-dam level gate house chambers. Stop-log slots are located on the reservoir side of each sluice gate. Flow over each waste weir falls into an 85 inch wide, 48 inch deep and 48 inch high chamber; a 33 inch diameter waste well riser connects this weir chamber to a common 3 ft x 2.5 ft horse-shoe shaped drain at invert El 185. The low level blow-offs also discharge into this drain.

b. Location

The reservoir is located in Silver Lake Park, approximately two miles south of St. George Ferry Terminal and west of Victory Boulevard. The south basin of the reservoir is located at the depression which formed the original Silver Lake.

c. Size Classification

The dam is considered to be of "intermediate" size; the maximum height is 55 ft and the storage capacity of both basins is 1416 acre ft (460 million gallons).

d. Hazard Classification

The dam is considered to be in the "high" hazard potential category.

e. Ownership

The dam is owned and, until 1971, operated by the New York City Bureau of Water Supply (BOWS). Since 1971 the project has been virtually abandoned.

f. Use of Dam

Until 1971, the impoundment formed by the dams was used as a holding reservoir for water delivered from the Catskill system to the Borough of Richmond. In 1971 the 460 million gallon Silver Lake Reservoir was replaced by a 100 million gallon underground storage system; since then, the Silver Lake Reservoir has been physically disconnected from New York City water supply system and virtually abandoned.

g. Design and Construction History

The dams and appurtenant structures were designed by the New York City Board of Water Supply. Construction of the project was begun in 1913 and completed in 1917.

h. Normal Operating Procedures

Prior to 1971, the reservoir was used as a short term water storage facility for the Borough of Richmond. The reservoir was filled with water from the Catskill system and regulated and released as required. Since 1971, the Catskill inlet, Richmond Conduit and South Conduit have been closed off and the Silver Lake Reservoir project virtually abandoned. Occasionally, water from the underground tanks is used to raise the level of the Silver Lake Reservoir.

1.3 PERTINENT DATA

a. Drainage Area, square miles	0.25
b. Discharge at Dam Site, cfs	
Maximum flood at site	No record
Overflow System:	
Elev 230 (Ungated spillway control)	22.6
Elev 233 (Horse shoe drain control)	73.5

Elev 238 (Horse shoe drain control) 77.1

c. Elevation (feet above M.S.L.)

Top of perimeter dikes	238
Top of Middle Dike	233
Spillway crest	229.3
Streambed at center line of North Dike	173

d. Reservoir

Length of pool (spillway crest), miles	0.44
Length of shoreline (spillway crest), miles	1.39
Surface area (spillway crest), acres	57.4

e. Storage, (acre-feet)

Spillway crest	1416
At maximum reservoir level (Elev 234)	1673

f. Dams

	North	West	South	Middle
Type	Earth			
Length, ft	1000	1400	1200	800
Crest width, ft	42±	42±	42±	29.75
Crest Elevation	238	238	238	233
Slopes (V):(H)				
Upstream	1:3	1:3	1:3	1:1.75
Downstream, Above El 218	1:3	1:5	1:2	1:1.75
Downstream, Below El 218	1:3		1:3	
Berm elevation, ft	218	None	218	None
Berm width, ft	10		10 min	
Slope Protection	Riprap			Conc. Slab
Cut-off	Conc. Wall	None		

g. Spillway

Type: Ungated 85 inch long flat crest weir leading to 33 inch diameter well via 85" x 4' x 4' weir chamber. Well connects to 2-1/2' x 3' sewer.

Number	Two
Crest Elevation	229.3 ft

h. Regulating Outlets

Water supply regulation =	1-48" inlet gate valve
	2-48" inlet-outlet gate valves
	2-48" outlet gate valves
	2-36" x 60" sluice gates
Blow-off	2-36" gate valves

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

The project facilities were designed by the New York City Board of Water Supply prior to 1913.

The available information on the project consists of the following:

a. Contract Documents
   (1) Contract 89, Contract Drawings for Construction of Silver Lake Reservoir and a porti on of the Richmond Conduit, 1913

   (2) Contract 89, Specifications, 1913

   (3) Contract 113, Specifications for Test Pits and Borings, 1911

   (4) Contract 132, Specifications for Borings, 1912

   (5) Contract 144, Drawings and Specifications for Gate Chamber Superstructures, Balustrades and Brick Paving (Middle Dike) 1916

b. Record Drawing, Sheet 133, General Plan and Elevations, Undated

c. Reservoir Capacity Curves, included on b. above

d. Record Drawings, Sheet C5196 and C5337, Boring Logs, Undated

e. Record Drawing, Gate Chamber, Sheet 18686 Rev. dated May 27, 1918

The Record Drawing (Item b. above) appears to be a post construction drawing and probably represents the as-built features.

2.2 CONSTRUCTION RECORDS

The Silver Lake Reservoir was constructed by the Beaver Engineering and Contracting Company during the period from 1914 to 1917. No records of construction are available for the project.

2.3 OPERATION RECORDS

The Silver Lake Reservoir Project has not been operated as part of the New York City water supply system since 1971. There has been little or no operation or maintenance since then. Records of pool elevation have not been kept since the project was removed from operation and the water level recorder, located in the gate operating chamber, was destroyed by vandals. Water level records were maintained prior to 1971.

2.4 EVALUATION OF DATA

Existing information was available at the BOWS New York City Office. The available data reviewed are considered adequate for this Phase I inspection and evaluation of safety.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

A visual inspection of the Silver Lake Reservoir was made on Thursday, August 17, 1978. At the time of the inspection the reservoir level was at El 228.9.

b. Embankment Dams

(1) Perimeter Dams (North, West and South Dikes)

There exists on the crest of the perimeter dikes a 24± ft wide paved roadway, a paved walkway and a chain link fence near the top of slope on the reservoir side.

There is heavy growth of brush, saplings and small trees on the upstream slopes of all perimeter dikes. The growth of trees appeared to be heavier near the north end of the North Dike. The downstream slopes, which are maintained by the New York City Parks Department, as part of the Silver Lake Golf Course, were covered only with grass except as follows: (a) there are trees having trunk diameters of 18 to 24 inches evenly spaced along and near the top of downstream slope of the West Dike; (b) there is heavy growth of brush, saplings and trees on the downstream face of the South Dike above the El 218 berm.

The stone riprap slope protection appeared to be in good condition. There were no signs of settlement, movement, sloughing or other distress visible on the crest, downstream slopes and visible portions of the upstream slopes. Cracks in and repaired areas of the roadway pavement appeared to be unrelated to the performance of the embankment dams.

No seepage was visible on either the downstream slopes, toe or area below the toe of the West and South Dikes. At the time of the inspection, there was a wet, soft area visible on the downstream berm of the North Dike; no seepage was visible at this location. There were also wet areas just below the toe of the North Dike; these areas correspond to the general vicinity of a spring which is noted on the preconstruction drawings.

(2) Middle Dike

The upstream and downstream concrete slope facing slabs are cracked at many locations; grass and brush grow from the cracks and panel joints. At several locations there appeared to be differential vertical movement between adjacent slab panels. There were no other signs of distress on the visible portions of the Middle Dike.

c. Gate Chamber

(1) Structures

The doors to the north and south gate house superstructure had been welded shut to keep out vandals; the welds had to be removed to gain access to the gate chambers. Although the windows were barred, glass panes in the window frames had been generally broken by vandals. The gate house superstructure floor (top-of-dam level), the gate operating chamber floor (el 218) and the connecting stairwells were strewn with debris, broken glass, garbage, overturned furniture, etc. All instrumentation (e.g. water level record, gate manifold pressure gages) that could be destroyed by hand, had been so damaged by vandals.

There was no evidence of structural distress, such as cracks or spalling, or the concrete walls and floors. Except for corrosion of some portions of the steel access ladders and gratings between the operating and gate chambers, walkways, railings and ladders appeared to be in good condition.

(2) Overflow Weirs (Spillway)

The north basin overflow weir was inspected. The weir, weir chamber and overflow well entrance appeared to be in good condition; however, the weir chamber was cluttered with debris, garbage, core boxes which would impede flows into the waste well.

(3) Regulating Gates

It was not determined whether the gate operating motor or drive train were operational. In general, the gate operating stands appeared to be in good condition to be operated manually. The gates themselves appeared to be in operable and in relatively good condition, even though they had been neither operated nor maintained since 1971. The condition of the exposed conduits appeared to be good. In general, the tie rods connecting gates to conduits were severely corroded.

d. Abutments

There were no signs of seepage or other unusual conditions at the abutments to the dam.

e. Reservoir Area

There was no evidence of sloughing, potentially unstable slopes or other unusual conditions which would adversely affect the dams.

3.2 EVALUATION OF OBSERVATIONS

Visual observations made during the course of the inspection did not indicate serious problems which would require either immediate investigation or immediate remedial action.

On the basis of this inspection, it could not be determined whether the wet area at the berm level of the North Dike is caused by seepage or poor surface drainage; in any event it is not considered to represent an unsafe condition. The wet area at the toe of the North Dike preexisted the dam and does not appear to be related to the impoundment.

The debris in the weir chamber should be removed to prevent blockage of the overflow well. The corrosion of the tie rods is considered to be an undesirable condition.

SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

In 1971 the Silver Lake Reservoir was removed from the system supplying water to the Borough of Richmond. Since then there has been no operation of the system. The blow-off valves have been closed and there has been no operation of the regulating gates.

4.2 MAINTENANCE OF THE DAM

Except for those areas of the perimeter dam downstream slopes which are maintained by the Parks Department, there has been no maintenance of the dam since 1971.

4.3 MAINTENANCE OF OPERATING FACILITIES

There has been no maintenance of the operating facilities since 1971.

4.4 WARNING SYSTEMS IN EFFECT

There is no warning system in effect.

4.5 EVALUATION

The overall maintenance of the project is considered to be less than desirable; maintenance is inadequate with respect to the following areas:

a. Control of vegetation on the dam

b. Maintenance of the overflow weirs

c. Maintenance of the gates, conduits and operating equipment particularly the low level outlets (blow-offs).

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 DRAINAGE BASIN CHARACTERISTICS

Silver Lake Reservoir is located on the northeastern corner of Staten Island. The total drainage area contributing to the reservoir is 0.25 sq. mi. (158.4 acres) with a reservoir surface area of 57.4 acres at the flowline, El 229.3. The basin rises to just over 360 feet at the southeastern corner in 1800 feet, and 340 feet in the northeast over a distance of 600 feet. About 15 percent of the basin is paved streets and buildings while the remainder is the Silver Lake Park. There are no streams in the basin.

5.2 SPILLWAY

The spillway consists of two trapezoidal weirs, one for each basin, which are located in the joint gate chamber structure built on the Middle Dike. According to information received during the inspection, the flat crests of the weirs were raised in the 1930's by 1.3 feet above their original elevation (228.0). Each weir crest has an 18-inch breadth and is 85 inches long and discharges into a chamber drained by a 33-inch diameter overflow well. The contents of the two wells are discharged through a single horse-shoe shaped concrete lined drain (3.0' x 2.5') into a distant sewer. The total spillway discharge is controlled by the capacity of the horse-shoe shaped drain which is estimated to be 73.5 cfs, flowing full for an assumed length of 2800 feet.

5.3 RESERVOIR CAPACITY

The total reservoir capacity[1] corresponding to spillway crest (El 229.3) is 461.4 million gallons (1416 acre-feet), of which 38.4% is available in the North Basin and the remainder in the South. The available surcharge storage between spillway crest and the reported low point on the perimeter dikes (El 238.0), based on a straight line extrapolation of the capacity curve in Reference (1), is about 156 million gallons or 479 acre-feet. This amount of surcharge storage is equivalent to 36.3 inches of runoff from the entire contributing watershed.

5.4 FLOODS OF RECORD

There are no flood records published for Silver Lake watershed. In interviews with New York City BOWS personnel it was revealed that, based on daily records of reservoir levels, no flow over the spillway took place during the August and October 1955 rainfalls which are known to have

been severe in the general region.

5.5 DESIGN FLOOD

Based on size and hazard classifications (paragraphs 1, 2c and 1.2d) the Probable Maximum Flood (PMF) was selected as the Design Flood. Accordingly, a 6-hour Probable Maximum Precipitation (PMP) for the Staten Island area was determined[2] as 19.5 inches. Since the lake area is 36%[3] of the watershed area and no infiltration losses will be effected in the paved 15% of the watershed, it was conservatively assumed that the overall losses would be negligible, therefore the entire PMP would be rainfall excess. Assuming that the reservoir is at spillway crest level (El 229.3) at the beginning of the PMP occurrence and that the horse-shoe shaped drain capacity is negligible, the reservoir level will rise approximately to El 234 (corresponding to 545 million gallons on the extrapolated storage capacity curve).

5.6 OVERTOPPING POTENTIAL

Under the conservative assumption made in the preceeding paragraph the entire volume of the PMP over the watershed could be stored in Silver Lake and still leave 4 feet of freeboard before overtopping. It is estimated that 186% of the PMP could be stored under the same assumptions without the lake level exceeding El 238.

5.7 EVALUATION

The analysis of the potential of the perimeter dikes being overtopped was based on assumed runoff contributions from the entire natural watershed. Since the area surrounding Silver Lake is in part developed, paved and sewered in a way to prevent contamination of the water supply, a more realistic approach would have been to disregard, after a more detailed investigation, the runoff from areas outside the perimeter dikes and roads. In conclusion, the applied method is conservative as far as natural inflow contribution is concerned. In the event of the PMP occurrence under the assumed conditions the water will overtop the Middle Dike by one foot. Considering, however the conservative assumption on which this investigation was based, even this overtopping seems unlikely.

The available storage capacity has precluded the construction of an emergency spillway. Therefore the evaluation of the adequacy of the existing spillways is limited to the purpose they serve, i.e. to prevent the lake level from rising, unchecked, above El 229.3 during normal operations. To accomplish this function, it is necessary to maintain in good flow conditions and free of obstacles the weirs, the chambers, the overflow

wells, the horse-shoe drain and the sewer in which they ultimately discharge. Should lack of maintenance cause water levels to rise considerably above the spillway crest, adverse initial conditions during a hypothetical PMP occurrence may result in endangering the safety of the perimeter dikes.

References:

1] Storage Capacity Curve, Drawing for Silver Lake Reservoir, N.Y. City BOWS file R-3.0SL.

2] Weather Bureau Technical Paper No. 40.

3] USGS Quad Sheets: Jersey City, N.J. - N.Y., 1967 and The Narrows, N.Y. - N.J., 1966.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

Visual observation did not indicate either existing or potential problems with the dams and gate structures. The observed cracks in the concrete slabs on the upstream and downstream faces of the Middle Dike are not considered to represent an unstable or otherwise dangerous condition. The differential settlement between adjacent slabs is also not considered to represent a dangerous condition.

b. Design and Construction Data

There exist no design computations or other data regarding the structural stability of the dam.

On the basis of the performance experience of the embankment dam, visual observations and engineering judgement, the embankment sections of the dam are considered to be stable at the present time.

c. Operating Records

There has been no record of operation since 1971.

d. Post Construction Changes

It was reported that the waste weir crests were raised from El 228 to El 229.3 (actually, 229.29) sometime during the 1930's. At that time other modifications to the gate house were also made.

e. Seismic Stability

The dam is located in Seismic Zone No. 1, therefore, no seismic analyses are warranted.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety

Although the Silver Lake Reservoir project has been neither maintained nor operated and virtually abandoned since 1971, examination of the available documents and visual inspection of the project features did not reveal conditions which are unsafe at the present time. The general condition of disrepair and neglect is not considered to be desirable and could, at some future date, affect the safety of the project as a result of further deterioration.

The storage capacity within the reservoir, between the spillway crest level (El 229.3) and the top of the perimeter dikes is conservatively estimated to be equal to 185 percent of the total 6-hour Probable Maximum Precipitation of 19.5 inches over the entire watershed area of 158.4 acres. On this basis the project facilities are considered adequate from a hydrologic viewpoint.

b. Adequacy of Information

The information and data available were adequate for performance of this investigation.

c. Additional Investigations

Additional investigations to assess the safety of the dams and appurtenant structures do not appear necessary.

7.2 REMEDIAL MEASURES

No remedial measures are required at the present time.

Certain measures, however, are recommended as follows:

a. Repair and maintain the general condition of the gate house structures.
   - Remove debris
   - Replace the windows with solid sturdy vandal resistant panels
   - Repair and maintain access ladders, platforms, electrical lines, lights, etc.

b. Repair and maintain, as required to operate manually, the low level outlets (the 36 inch blow-off gate valves and the 30" x 92" sluice gates).

c. Maintain in a clean and operable condition the waste weirs, the weir chambers and overflow wells.

d. Replace corroded tie rods in the valve chamber.

e. Heavy brush, shrubs and young saplings should be removed from all locations on the embankments. Large conifers, but not deciduous hardwoods, should be removed. The remaining trees should be inventoried and their condition monitored. If a tree dies, the area around the tree should be closely monitored for seepage.

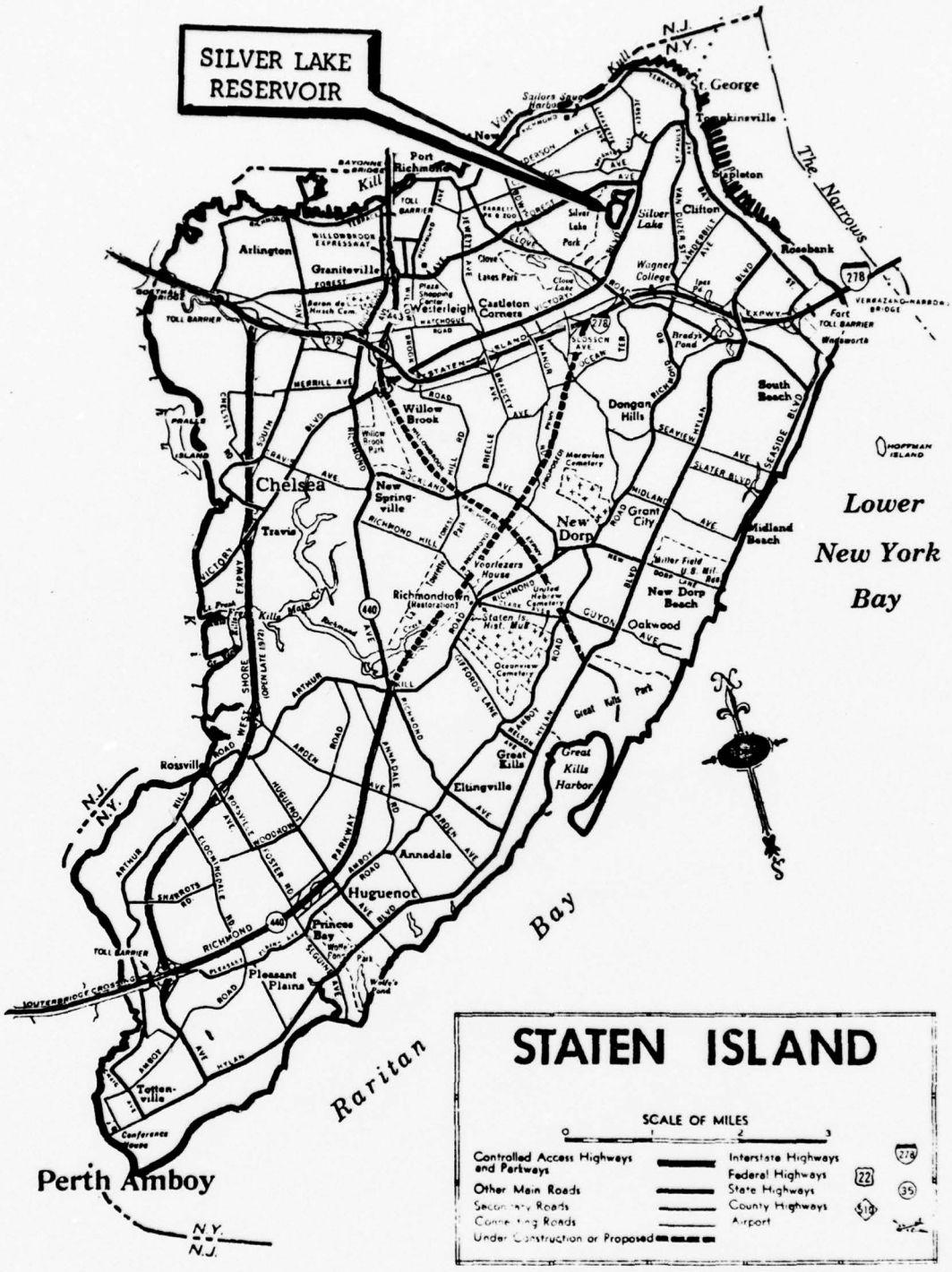
f. Establish a program of periodic inspections of the project features.

g. Prepare an operation and maintenance manual for the project, which would include requirements for periodic inspection in "excercising" of the blow-offs.

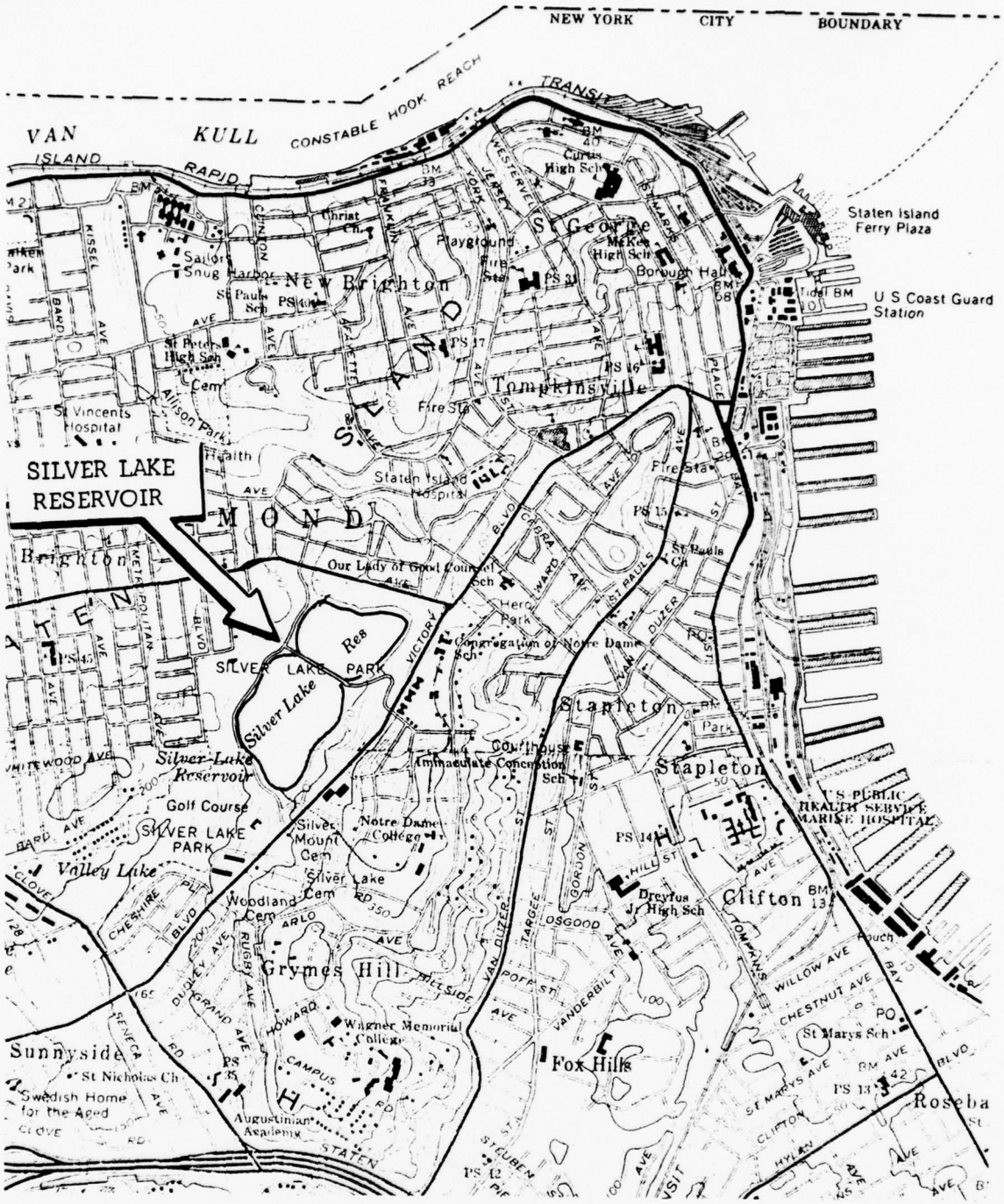
h. Monitor periodically the wet areas on the downstream slope and at the toe of the North Dike.

DRAWINGS

APPENDIX A

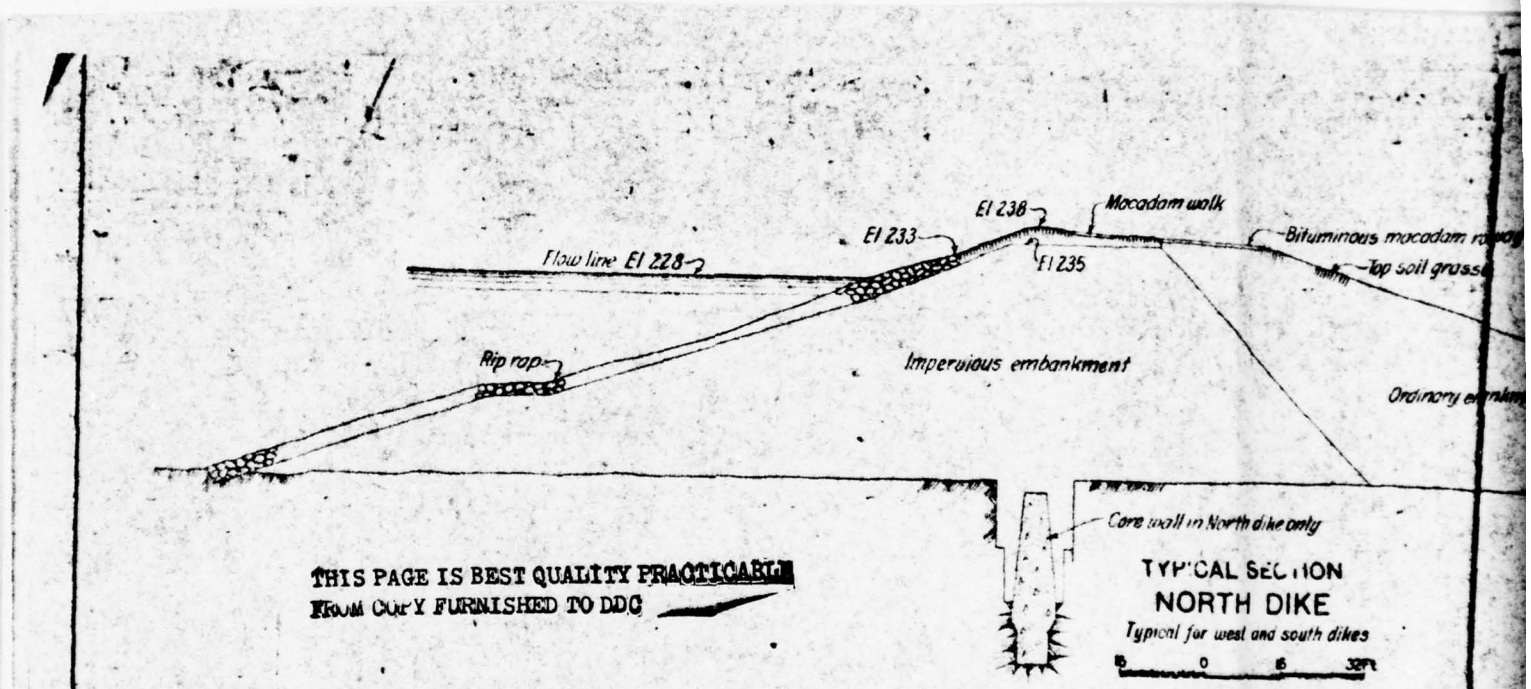


VICINITY MAP
SILVER LAKE RESERVOIR



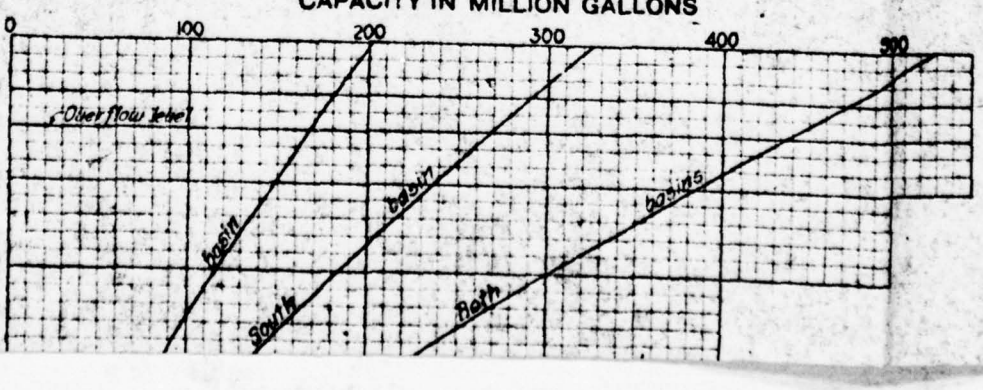
CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

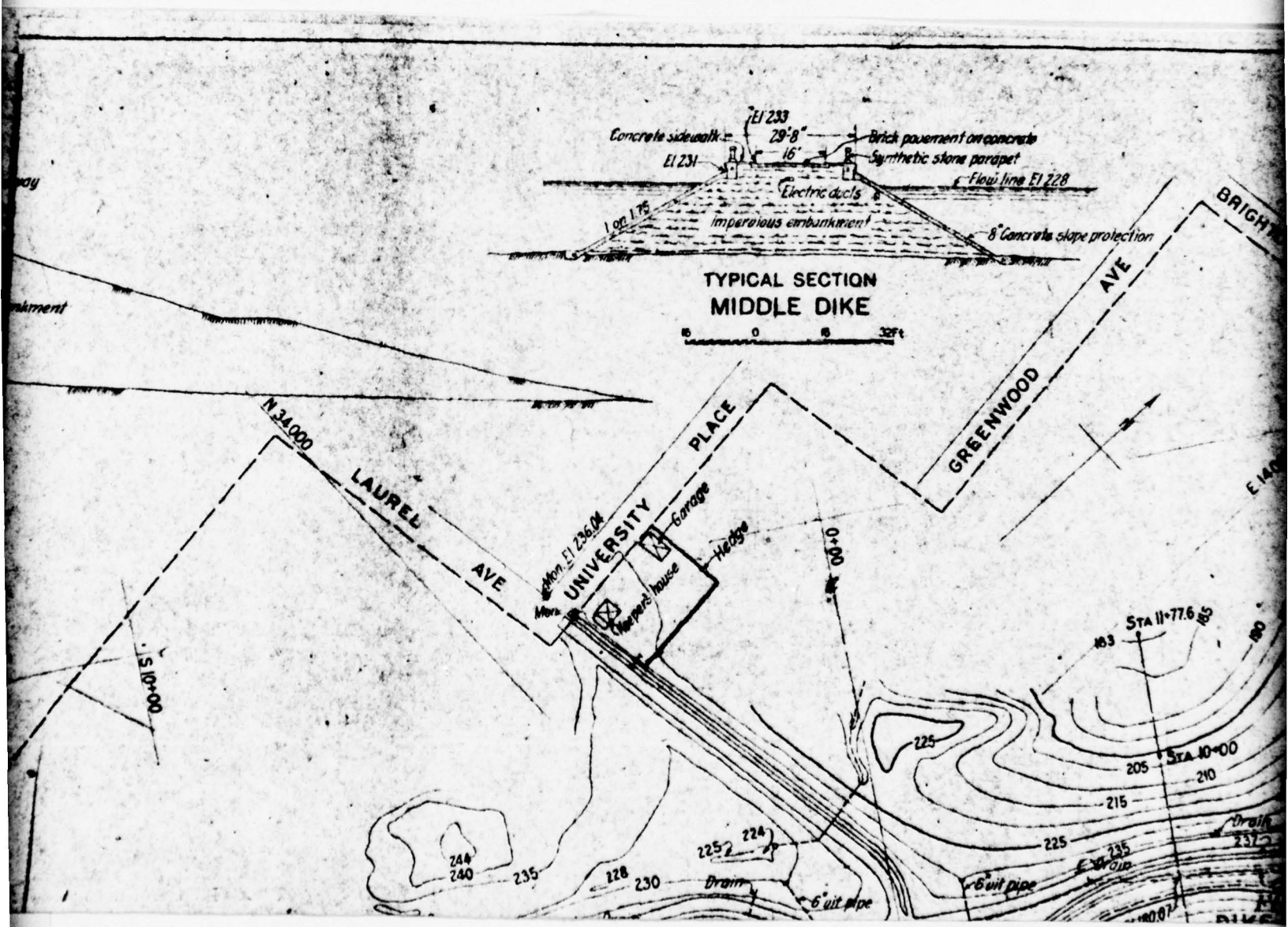
TOPOGRAPHIC MAP : SILVER LAKE RESERVOIR

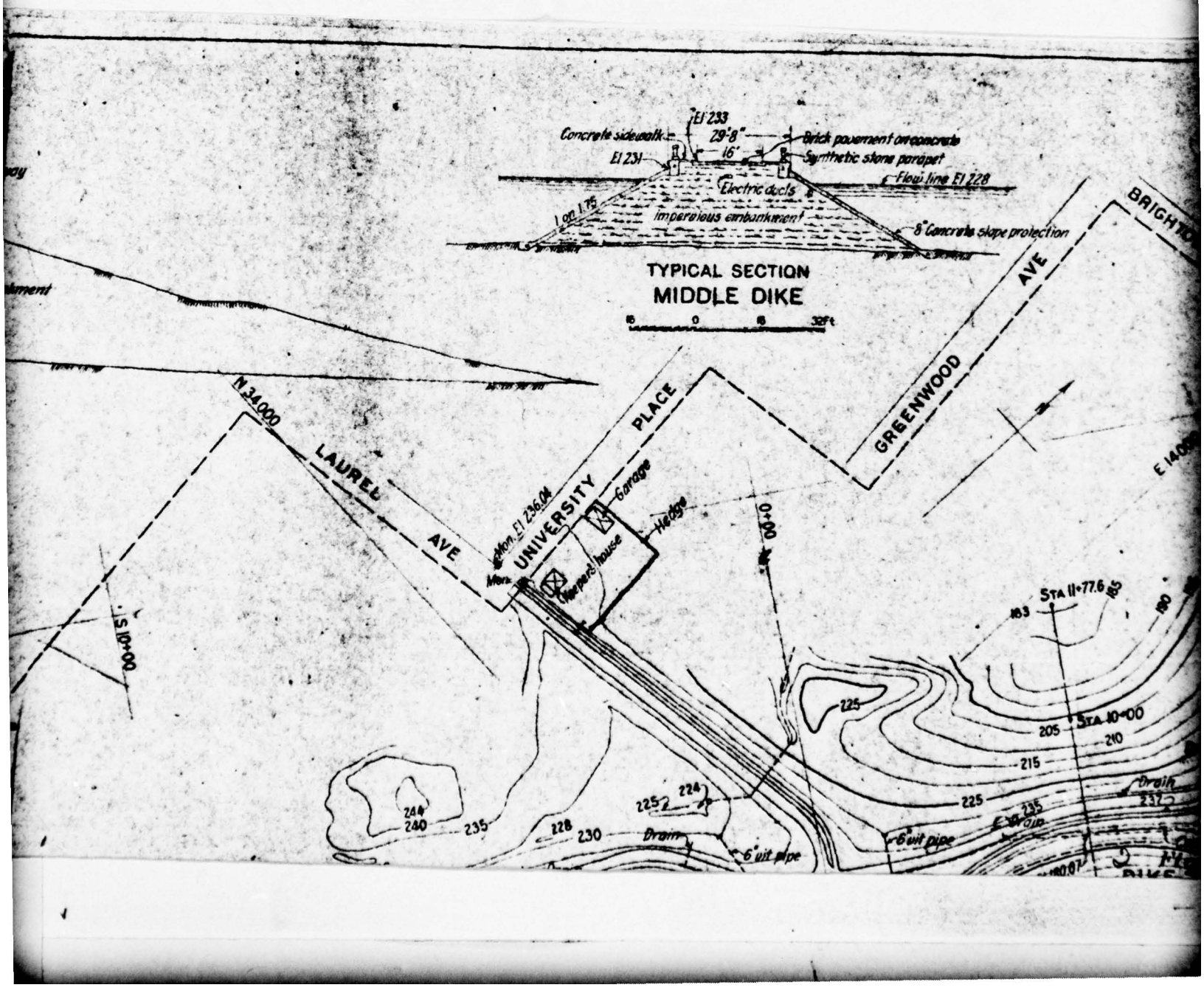


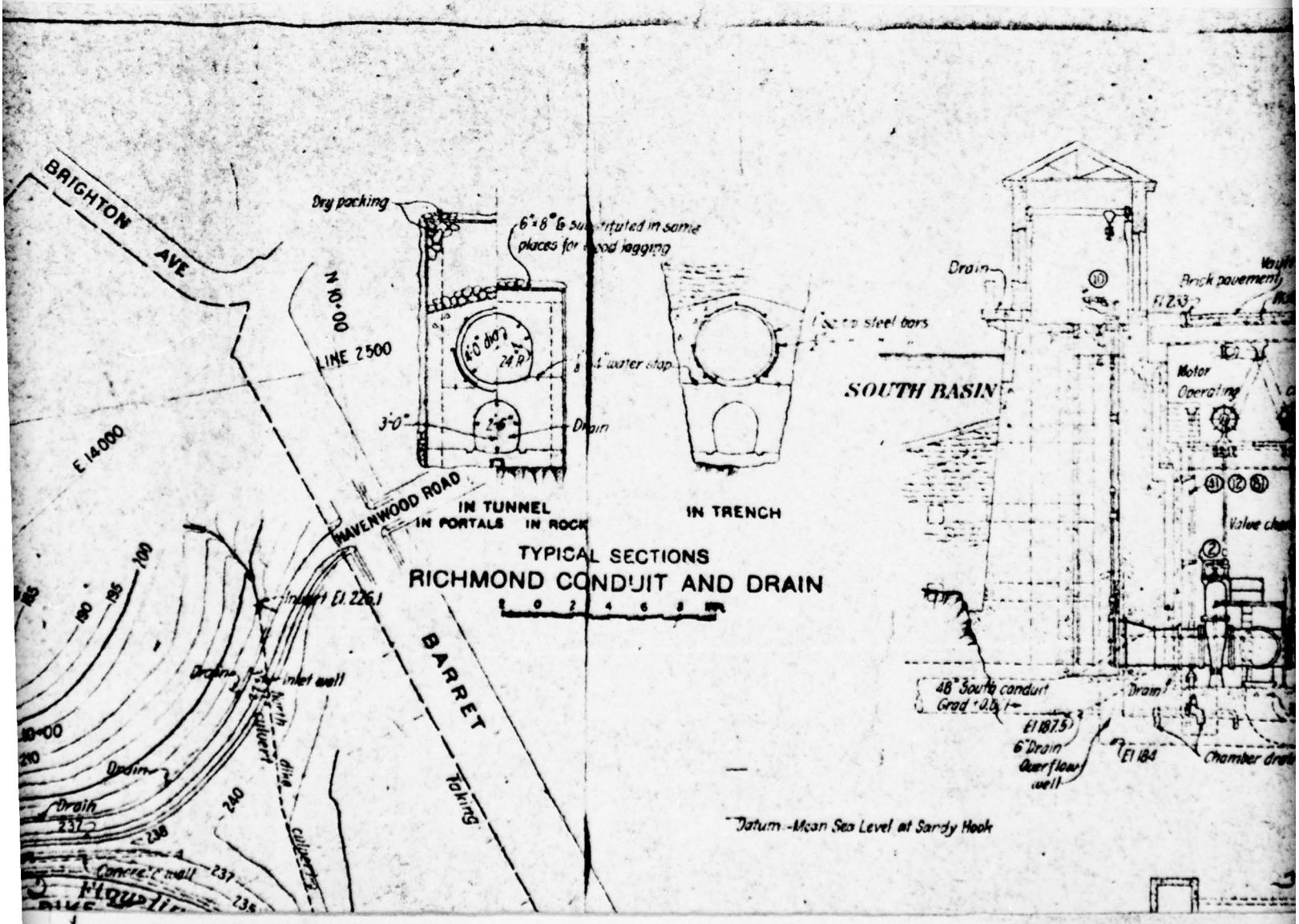
CAPACITY IN MILLION GALLONS

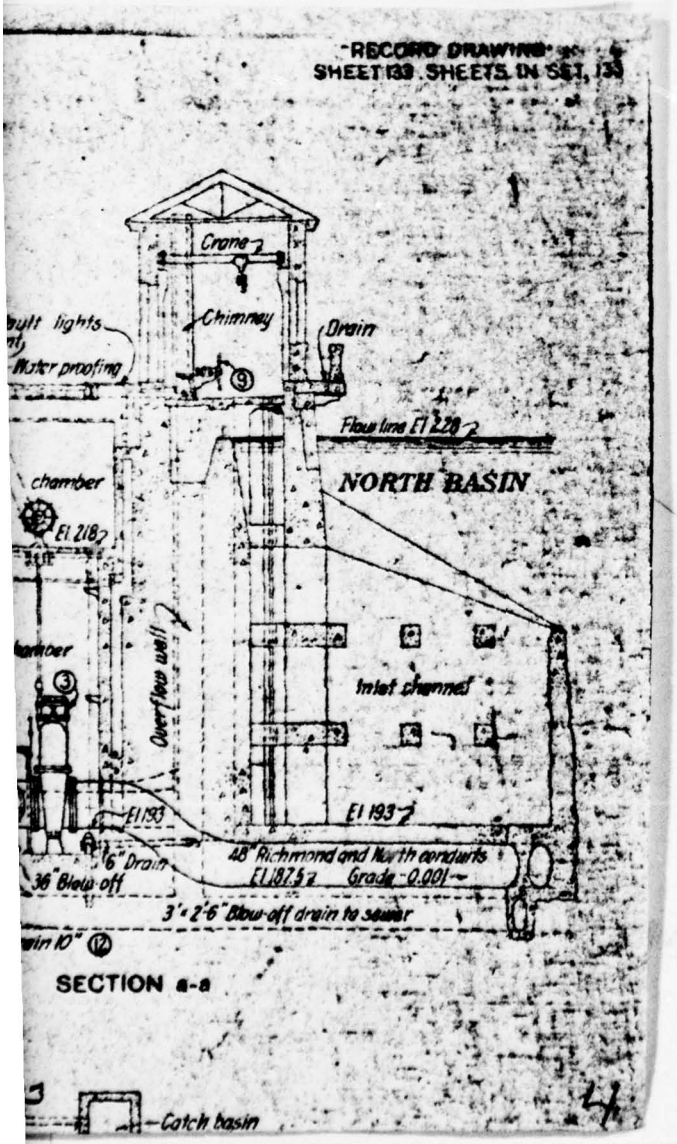
NORTH BASIN MG	SOUTH BASIN MG	BOTH BASINS MG	ELEV
182	292	474	
175	281	456	230
168	270	438	228
161	259	420	
155	248	403	
148	238	386	225
142	227	369	
135	216	351	
129	206	335	
123	195	318	
117	185	302	220
110	175	285	
104	166	270	
98	156	254	
93	146	239	
87	137	224	215

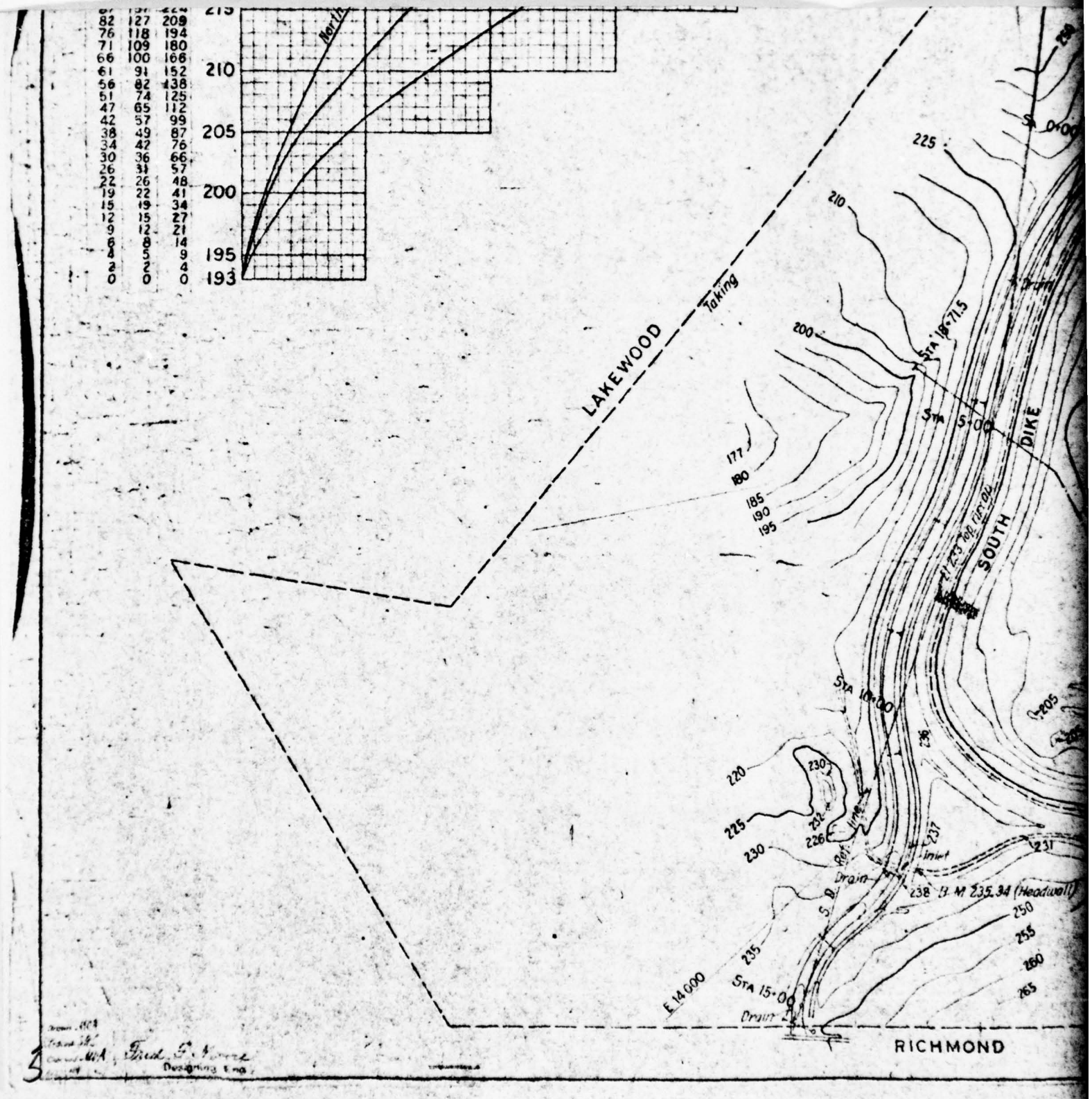


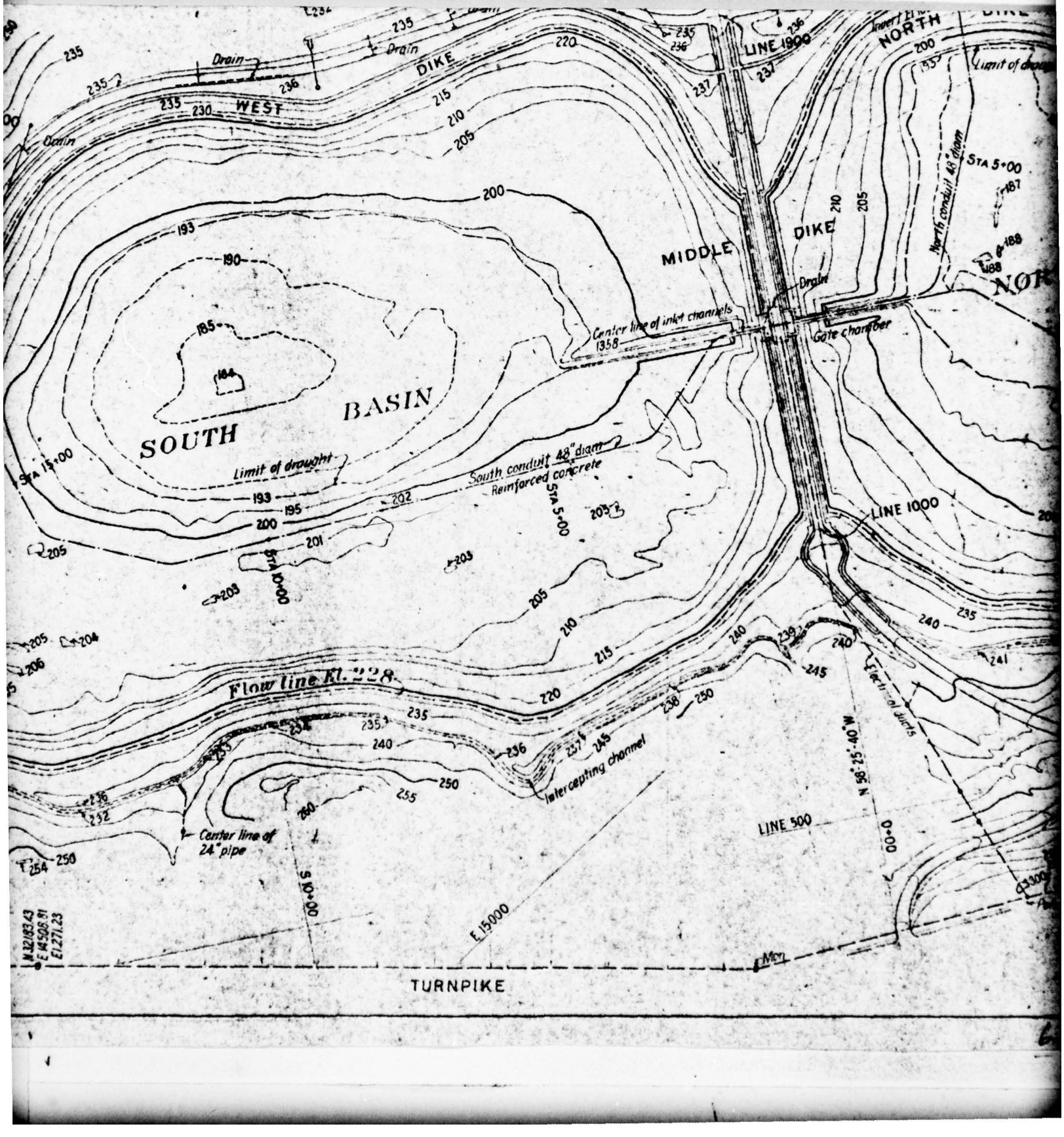

El 233
Concrete sidewalk
29'-8"
Brick pavement on concrete
El 231
16'
Synthetic stone parapet
℄ Flow line El 228
Electric ducts
1 on 1.75
Impervious embankment
8" Concrete slope protection
TYPICAL SECTION
MIDDLE DIKE
15 0 15 30Ft
BRIGHT
AVE
GREENWOOD
PLACE
UNIVERSITY
LAUREL
AVE
N 34,000
Garage
Keepers house
Elev. El 236.04
Sta 11+77.6
Sta 10+00
Sta 10+00
225
205
210
215
225
224
225
235
240
244
235
228
230
Drain
6" cast pipe
6" cast pipe
Drain
Drain

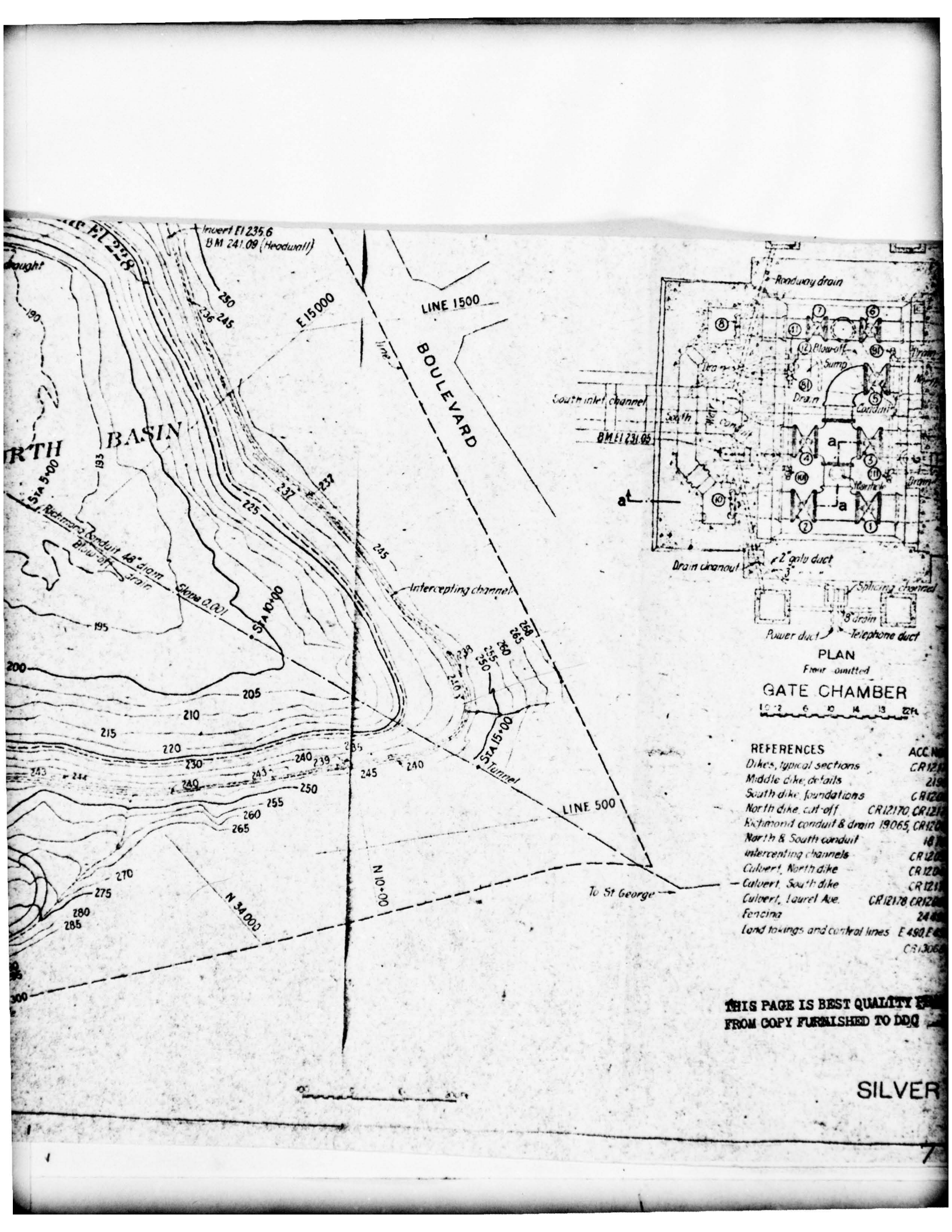

El 233
Concrete sidewalk
29'-8"
16'
Brick pavement on concrete
El 231
Synthetic stone parapet
℄ Flow line El 228
Electric ducts
1 on 1.75
Impervious embankment
8" Concrete slope protection
TYPICAL SECTION
MIDDLE DIKE
15 0 15 30ft
BRIGHTON AVE
GREENWOOD AVE
PLACE
UNIVERSITY
LAUREL AVE
N 34000
Mon. El 236.04
Garage
Hedge
Keepers house
0+00
1+00
Sta 11+77.6
Sta 10+00
185
180
183
225
205
210
215
225
224
225
235
240
244
235
228
230
Drain
6" vit pipe
6" vit pipe
Drain
237


BRIGHTON AVE
Dry packing
6"x8" G
places for
LINE 2500
N 10°00
E 14000
WAVERWOOD ROAD
IN TUNNEL
IN PORTALS
IN ROCK
IN TRENCH
Drain
Drain
SOUTH BASIN
Brick pavement
Motor
Operating
Valve cha
TYPICAL SECTIONS
RICHMOND CONDUIT AND DRAIN
0 2 4 6 8
Invert El. 226.1
Drain
Inlet wall
Arch culvert
Drain
Drain
Concrete wall
Flood
BARRET
Taking
48" South conduit
Grad
El 187.5
6" Drain
Overflow
well
El 184
Chamber
Datum - Mean Sea Level at Sandy Hook

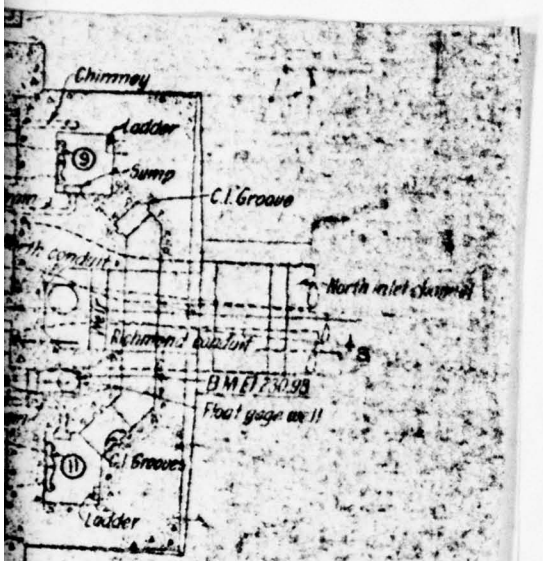

"RECORD DRAWING"
SHEET 139 SHEETS IN SET 139
Crane
Chimney
Drain
ult lights
Water proofing
Flow line El 228
NORTH BASIN
chamber
El 218
Overflow wall
Inlet channel
El 193
El 193
48" Richmond and North conduits
El 187.5 Grade -0.001
6" Drain
36" Blow off
3'-2'-6" Blow-off drain to sewer
SECTION a-a
Catch basin


82 127 209
76 118 194
71 109 180
66 100 166
61 91 152
56 82 138
51 74 125
47 65 112
42 57 99
38 49 87
34 42 76
30 36 66
26 31 57
22 26 48
19 22 41
15 19 34
12 15 27
9 12 21
6 8 14
4 5 9
2 2 4
0 0 0
215
210
205
200
195
193
North
LAKEWOOD
Taking
SOUTH DIKE
Sta 18+71.5
Sta 5+00
Sta 10+00
Sta 15+00
E 14,600
Drain
Inlet
RICHMOND
225
210
200
177
180
185
190
195
220
230
235
238 B.M. 235.34 (Headwall)
250
255
260
265


DIKE
WEST
Drain
Drain
Drain
LINE 1900
NORTH
MIDDLE
DIKE
Drain
Gate chamber
Center line of inlet channels
1358
North conduit 48" diam
STA 5+00
SOUTH
BASIN
Limit of drought
South conduit 48" diam
Reinforced concrete
STA 5+00
STA 10+00
LINE 1000
Flow line El. 228
Intercepting channel
Center line of
24" pipe
LINE 500
N 58°25'-00"W
0-00
S 10+00
E 15000
N 32183.43
E 14506.91
El 271.23
TURNPIKE



SILVER



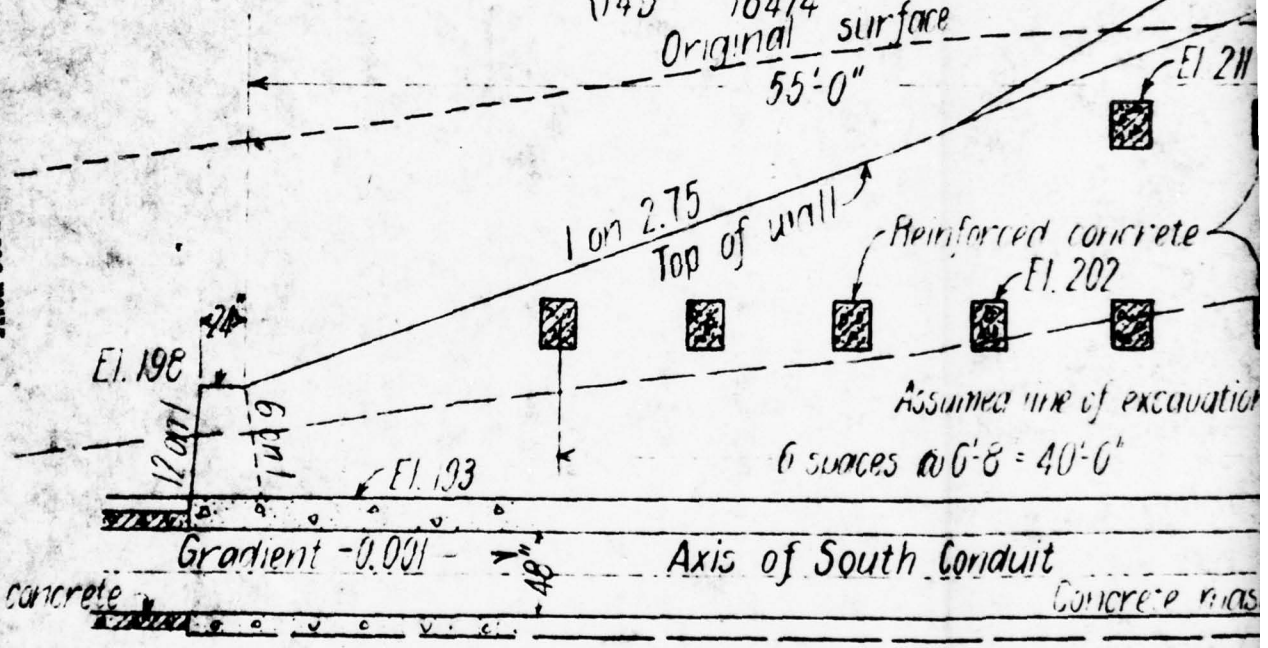
NOS	REFERENCES	ACC NOS
12175	Gate chamber	48686
21995	①②③④⑤ 48" gate valves	19416 19452
12088	⑥⑦ 36" gate valves	1949
12177	⑧⑨ 30" 42" sluice gates	1944
12001	⑩⑪ 3" 5" " "	194
8788	⑭⑮⑲㉑ 6" angle gate valves (drains)	19
2057	⑬ 6" gate valve (drain)	194
2044	⑫ 10" gate valve (Chamber drain)	194
2179	Superstructures	243
2868	Electrical ducts	CK 130
892		
2891		
68		

LAKE RESERVOIR

8

1. References

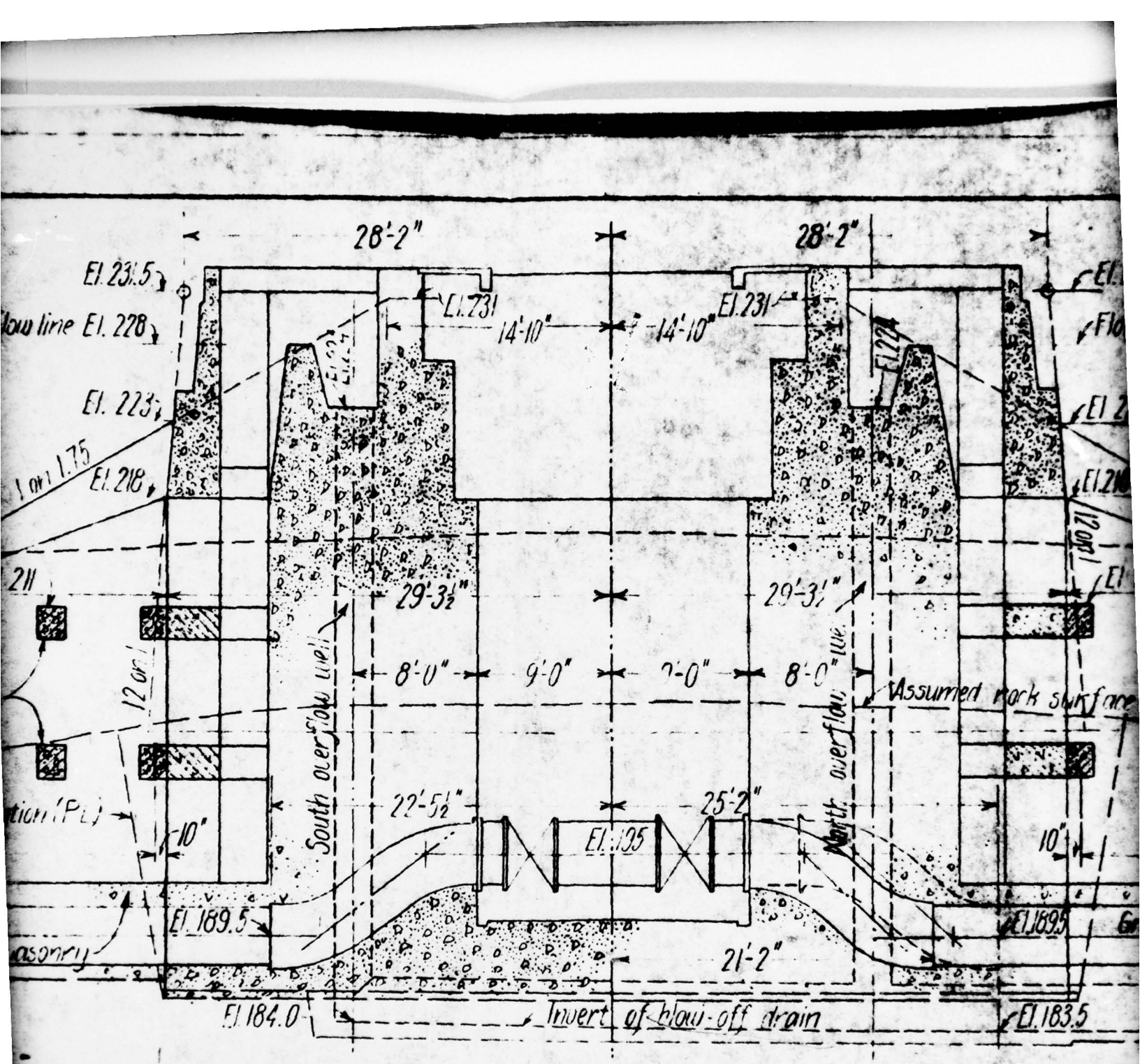
	Sheet	Acc.
Gate Chamber -		
Elevations and Inlet Channel details (Sections N-N to Q-Q)	11B	18687
Masonry Plan	12A	18475
Vertical Sections A-A to D-D	14A	18469
	14B	18470
	14C	18473
	14D	18474



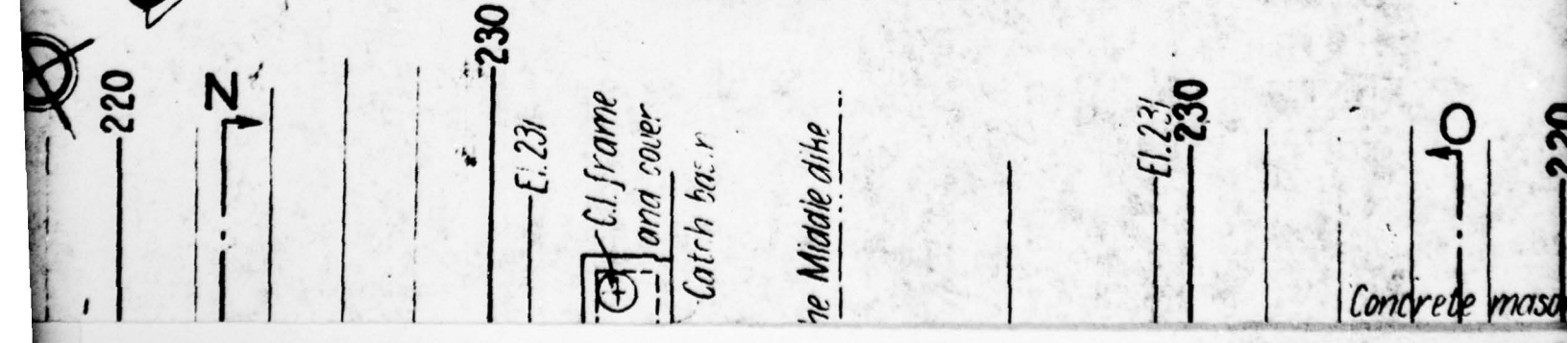
2. Concrete masonry protection for dike slopes shall be laid in alternate blocks not more than 8 feet in larger dimension. Weep holes, of about 2 square inches area, shall extend entirely through concrete at positions directed.

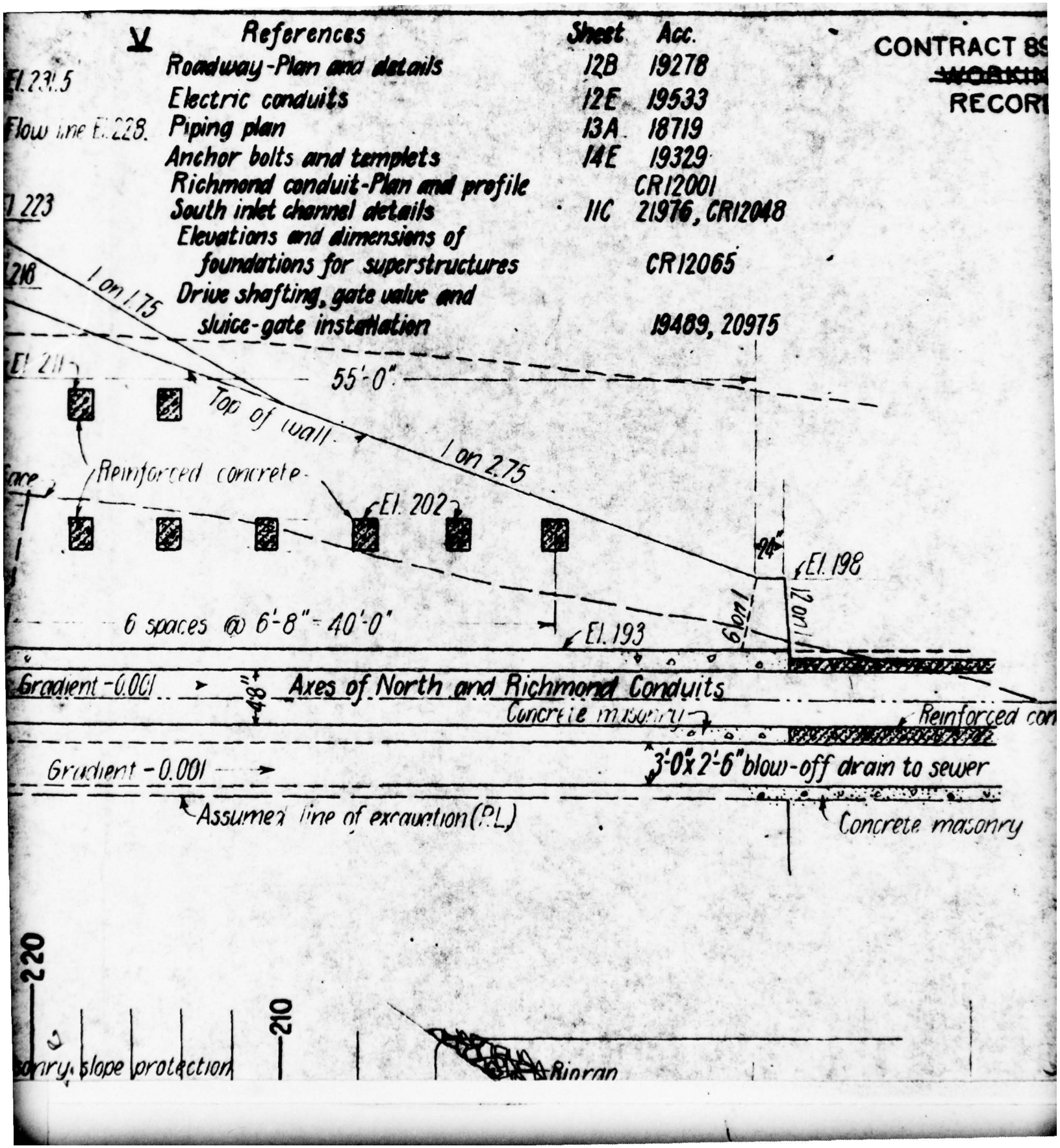
3. The gradient of the North Conduit, beyond the gate chamber inlet channel may be adapted to the general slope of the reservoir bottom.

4. Limits of excavation and masonry and extent of paving and riprap shall be as shown unless modified by the Engineer to meet unexpected developments of


28'-2"
28'-2"
El. 231.5
El. 231
El. 231
14'-10"
14'-10"
El. 223
El. 218
29'-3½"
29'-3½"
8'-0"
9'-0"
7'-0"
8'-0"
Assumed rock surface
South overflow line
North overflow line
22'-5½"
25'-2"
El. 195
10"
10"
El. 189.5
El. 189.5
21'-2"
El. 184.0
Invert of blow-off drain
El. 183.5

SECTION M-M


220
N
230
El. 231
C.I. frame
and cover
Catch basin
Middle dike
El. 231
230
O
Concrete


References
Sheet Acc.
Roadway-Plan and details 12B 19278
Electric conduits 12E 19533
Piping plan 13A 18719
Anchor bolts and templets 14E 19329
Richmond conduit-Plan and profile CR12001
South inlet channel details 11C 21976, CR12048
Elevations and dimensions of foundations for superstructures CR12065
Drive shafting, gate valve and sluice-gate installation 19489, 20975
CONTRACT 8S
RECORI
El. 231.5
Flow line El. 228.
El 223
218
1 on 1.75
El. 211
55'-0"
Top of wall
1 on 2.75
Reinforced concrete
El. 202
24"
El. 198
6 spaces @ 6'-8" = 40'-0"
El. 193
1 on 1
12 on 1
Gradient -0.001
48"
Axes of North and Richmond Conduits
Concrete masonry
Reinforced con
Gradient -0.001
3'-0" x 2'-6" blow-off drain to sewer
Assumed line of excavation (P.L.)
Concrete masonry
220
210
sonry slope protection
Riprap

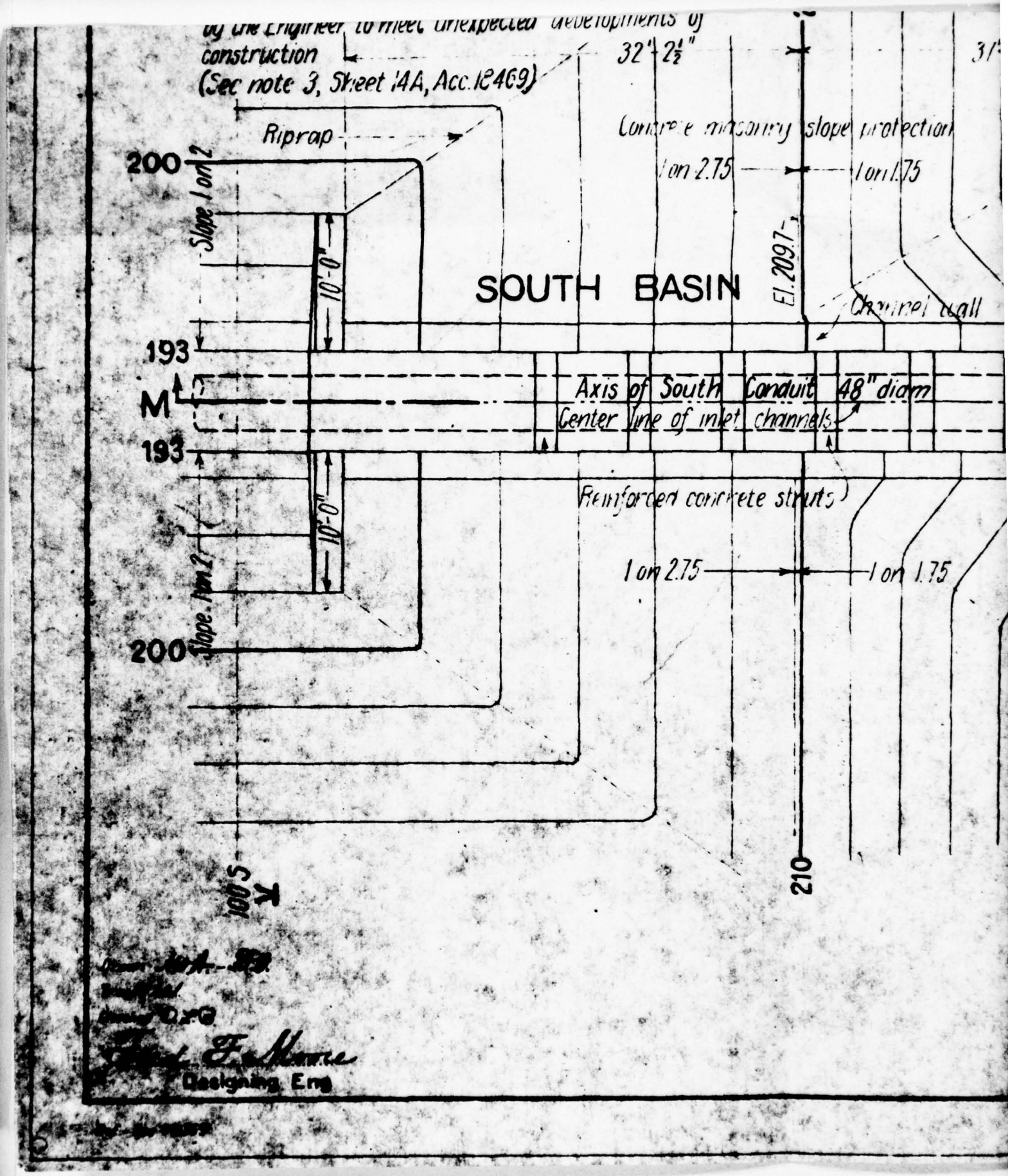
SHEET 11A

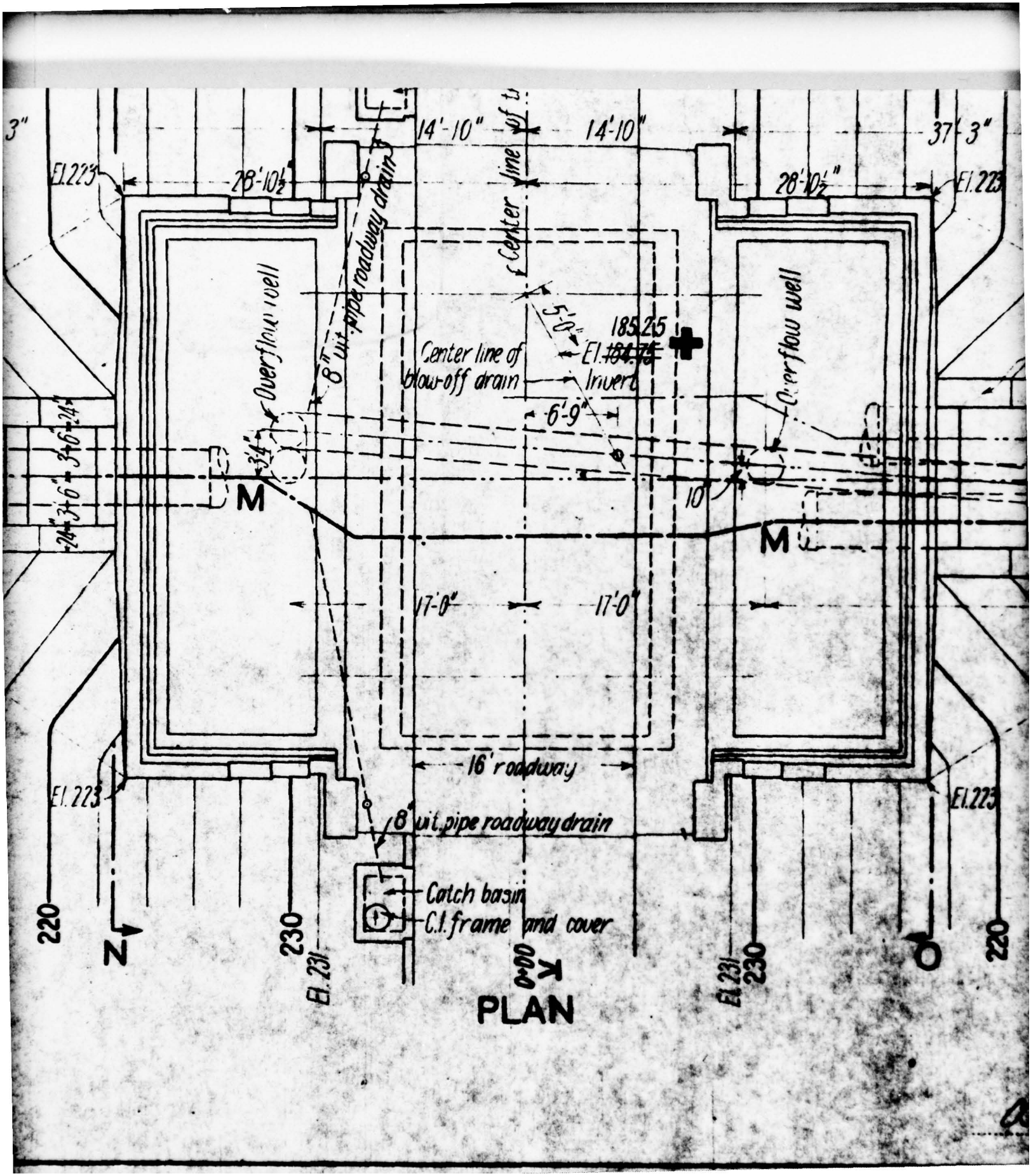
~~DRAWING~~

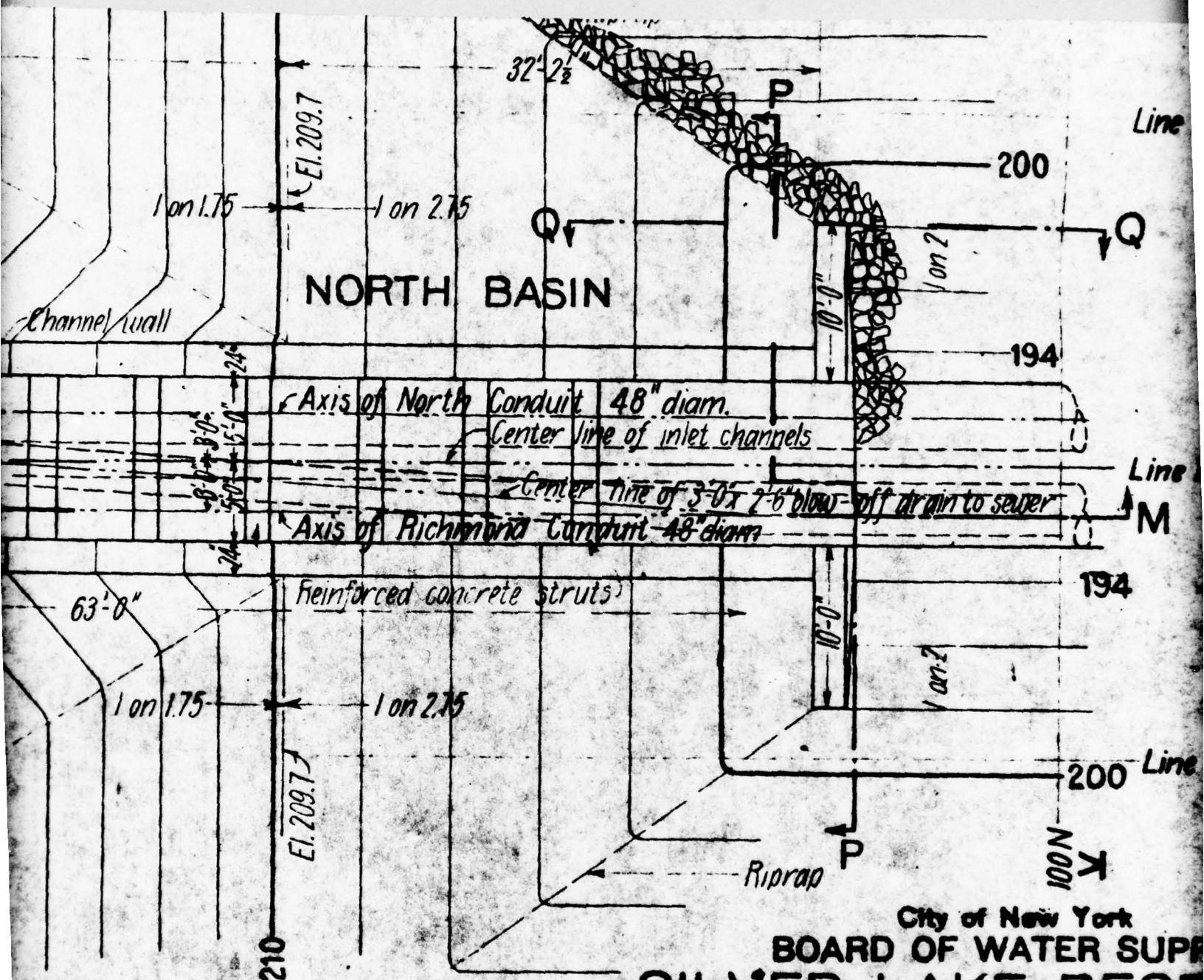
DRAWING V

crete

4


by the Engineer to meet unexpected developments of construction
(See note 3, Sheet 14A, Acc. 12469)
32' 2½"
Riprap
Concrete masonry slope protection
1 on 2.75
1 on 1.75
200
Slope 1 on 2
10'-0"
SOUTH BASIN
El. 209.7
Channel wall
193
M
Axis of South Conduit 48" diam
Center line of inlet channels
193
Reinforced concrete struts
10'-0"
1 on 2.75
1 on 1.75
Slope 1 on 2
200
100'S
210
Designing Eng


14'-10"
14'-10"
37'-3"
El. 223
28'-10½"
28'-10½"
El. 223
℄ Center line of
8" cast pipe roadway drain
Overflow well
Overflow well
5'-0"
185.25
El. 184.75
Center line of blow-off drain
Invert
6'-9"
3'-4"
M
M
10
24"
3'-6"
3'-6"
24"
17'-0"
17'-0"
16' roadway
El. 223
El. 223
8" cast pipe roadway drain
Catch basin
C.I. frame and cover
220
230
El. 231
El. 231
230
220
N
O
K
PLAN



City of New York

BOARD OF WATER SUPP

SILVER LAKE RESE

GATE CHAMBER

GENERAL PLAN AND SEC

10 2 6 10 14 18 22

AUGUST 20, 1913

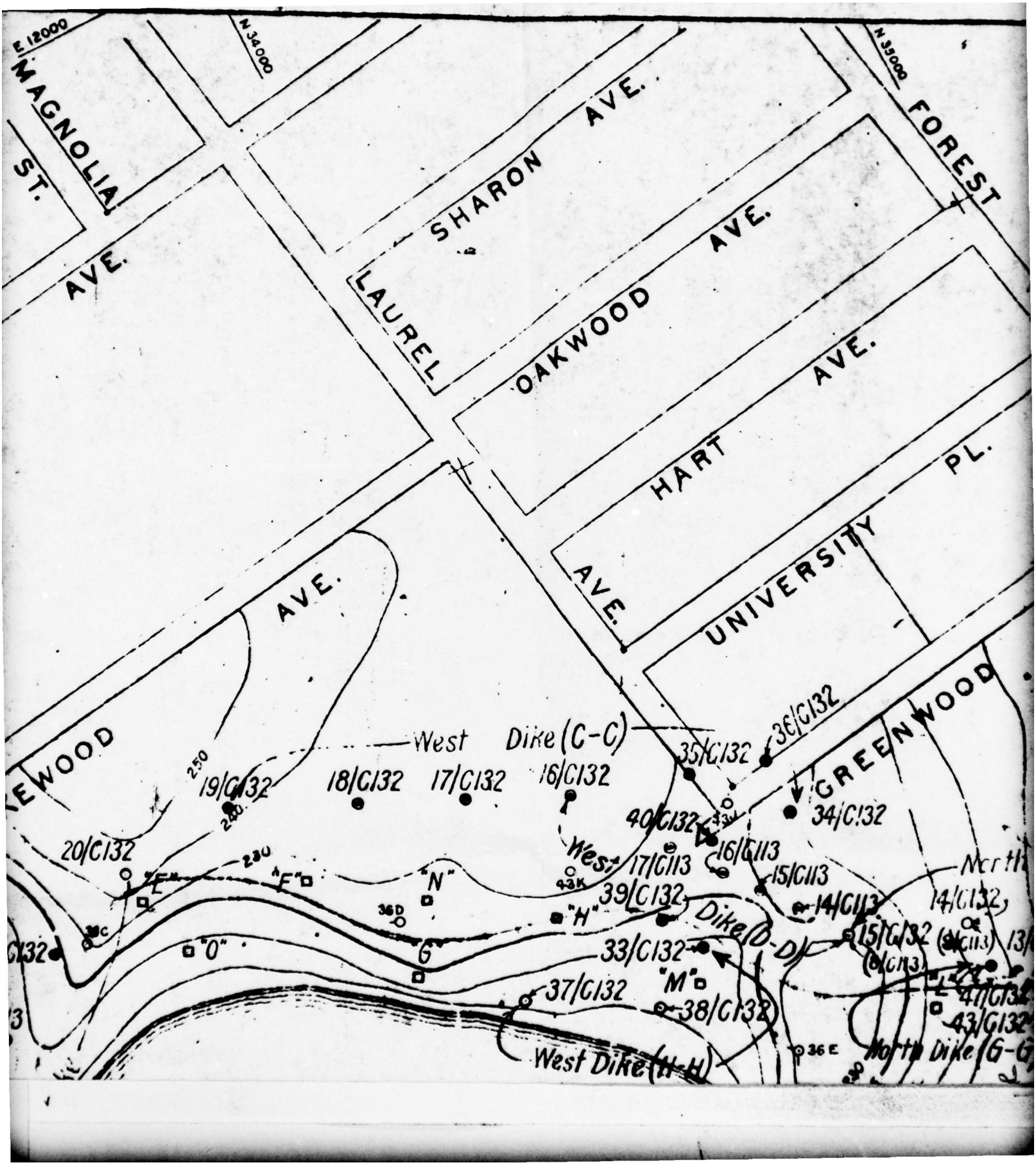
Revision of MARCH 9, 1914 shown thus ✚

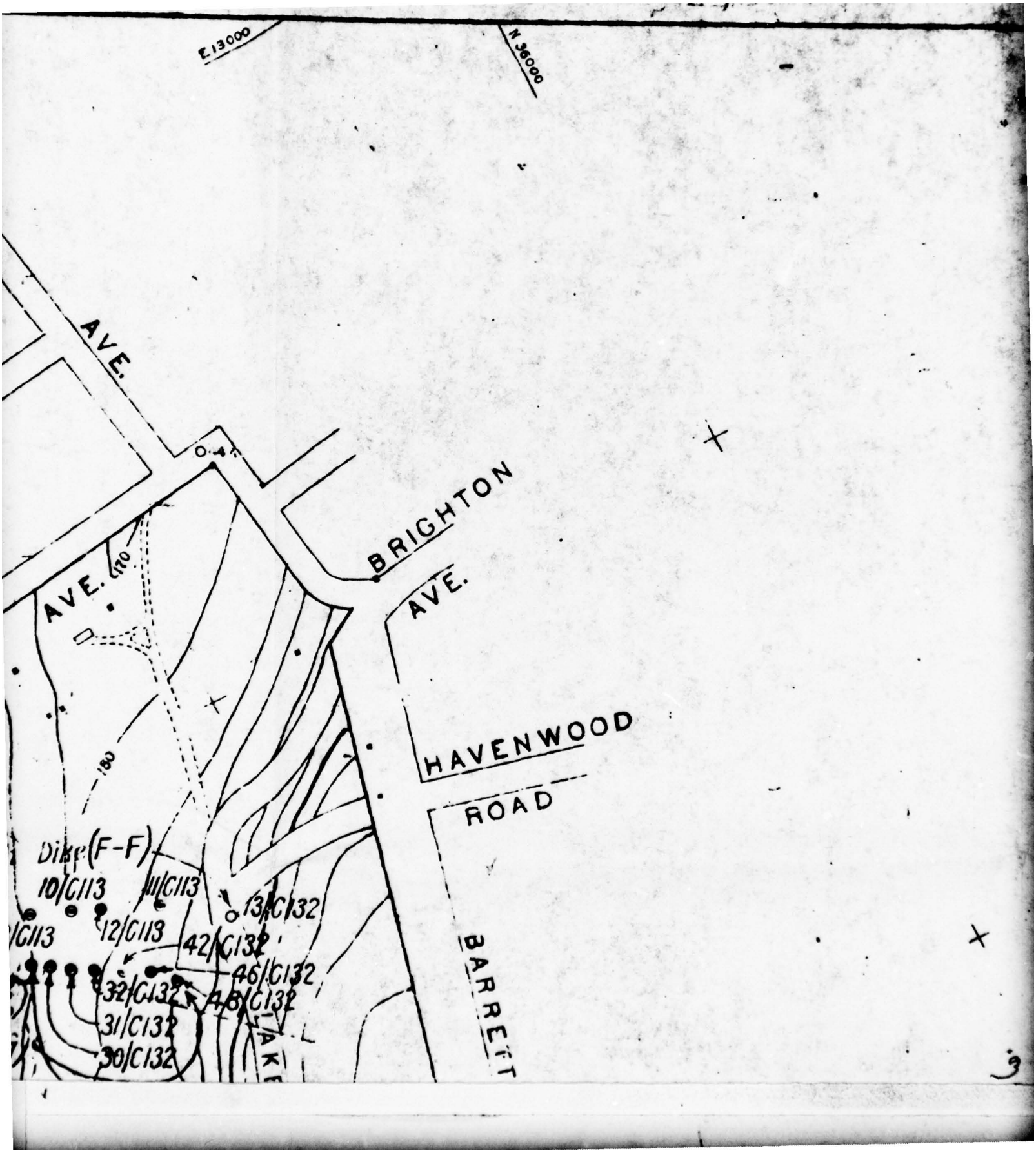
V Revised MAY 27, 1916

Dept Eng Hdqrs and Acting Chief Eng

R

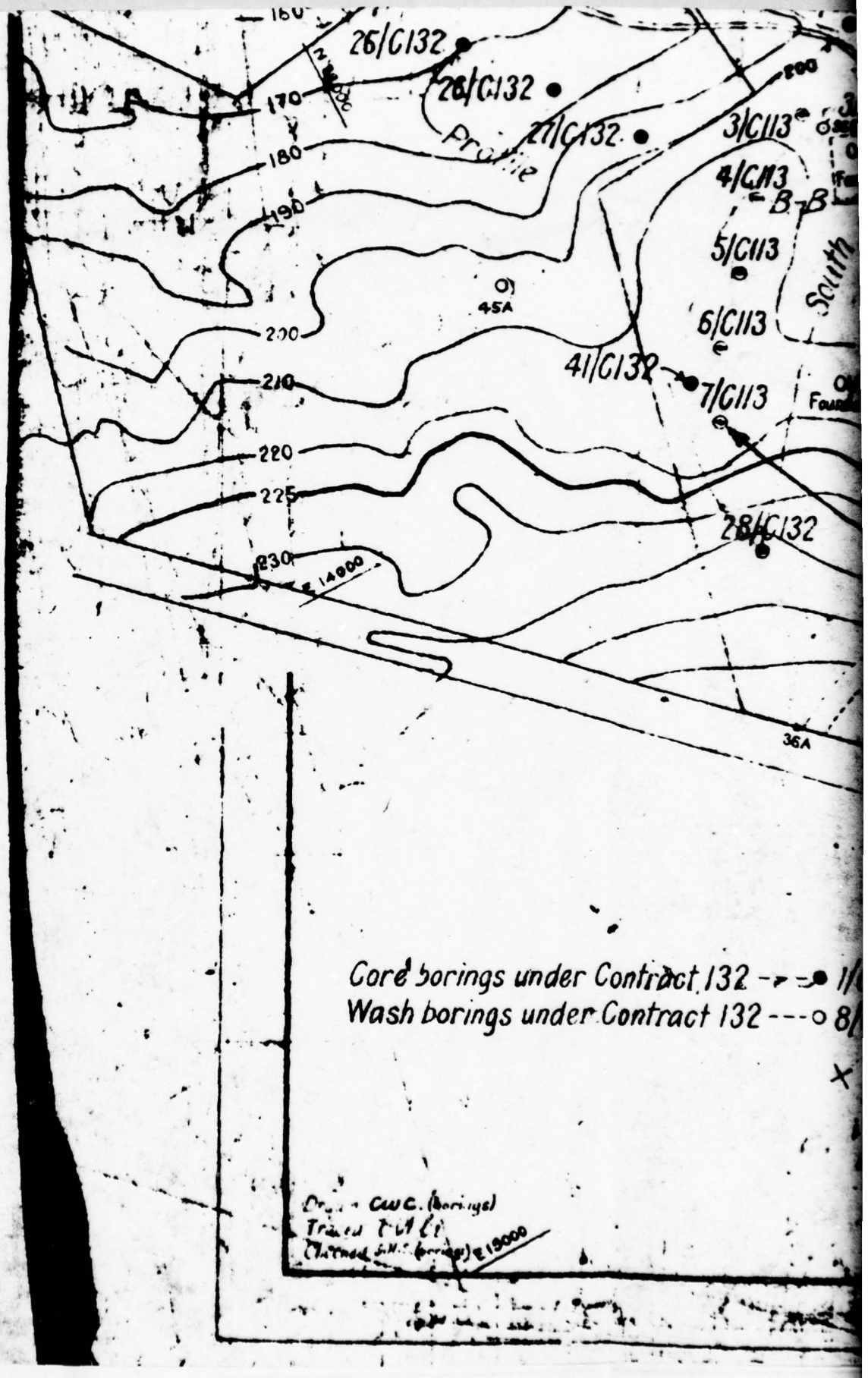
File [illegible] - 3.75

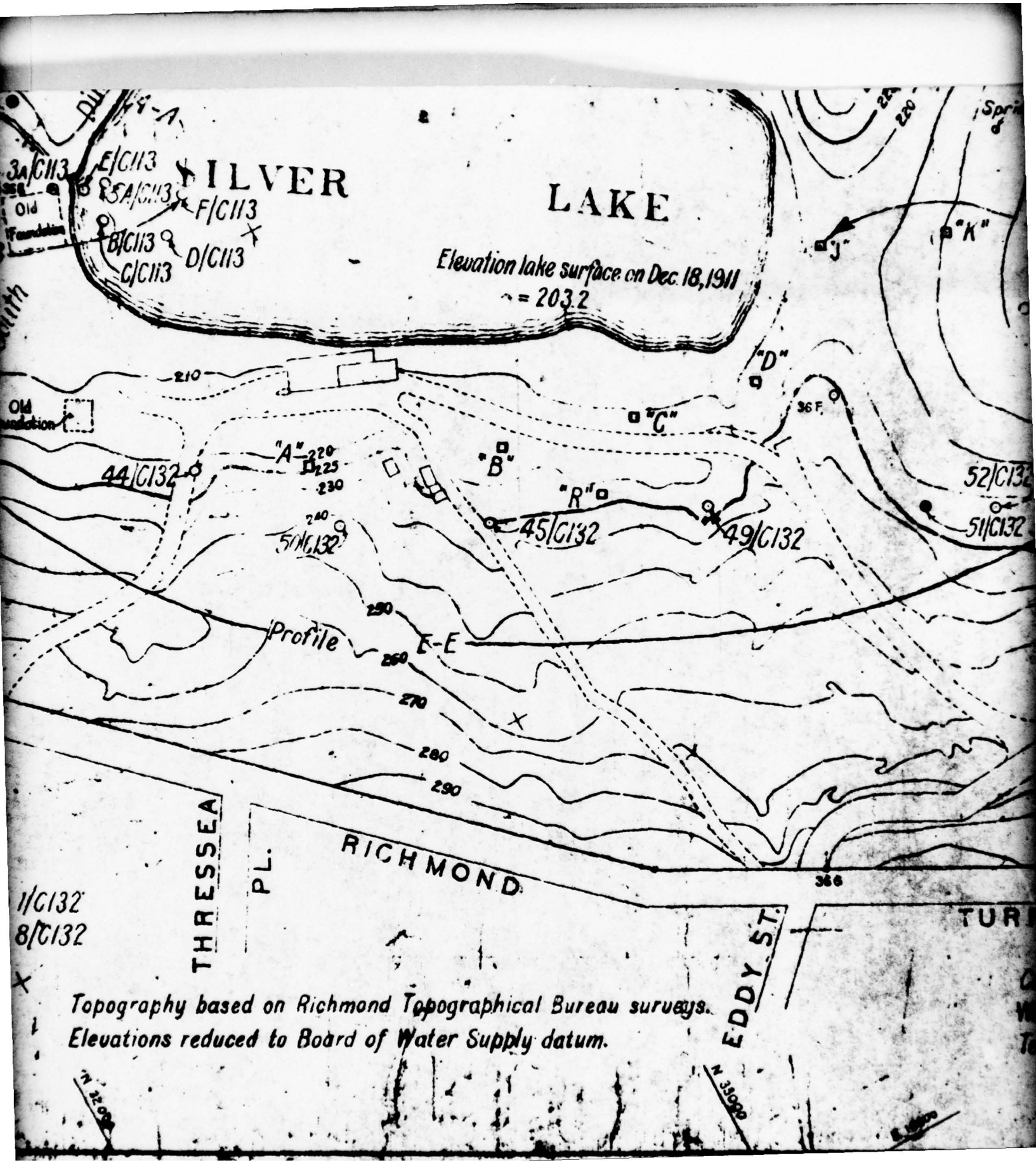

E 12000
N 34000
N 35000
MAGNOLIA
ST.
AVE.
SHARON AVE.
LAUREL
OAKWOOD AVE.
HART AVE.
UNIVERSITY PL.
AVE.
AVE.
FOREST
GREENWOOD
West Dike (C-C)
250
240
230
19/C132
18/C132
17/C132
16/C132
35/C132
36/C132
34/C132
40/C132
20/C132
"E"
"F"
"N"
"H"
"O"
"M"
17/C113
16/C113
15/C113
14/C113
39/C132
14/C132
15/C132
33/C132
37/C132
38/C132
41/C132
43/C132
Dike (D-D)
West Dike (H-H)
36 E

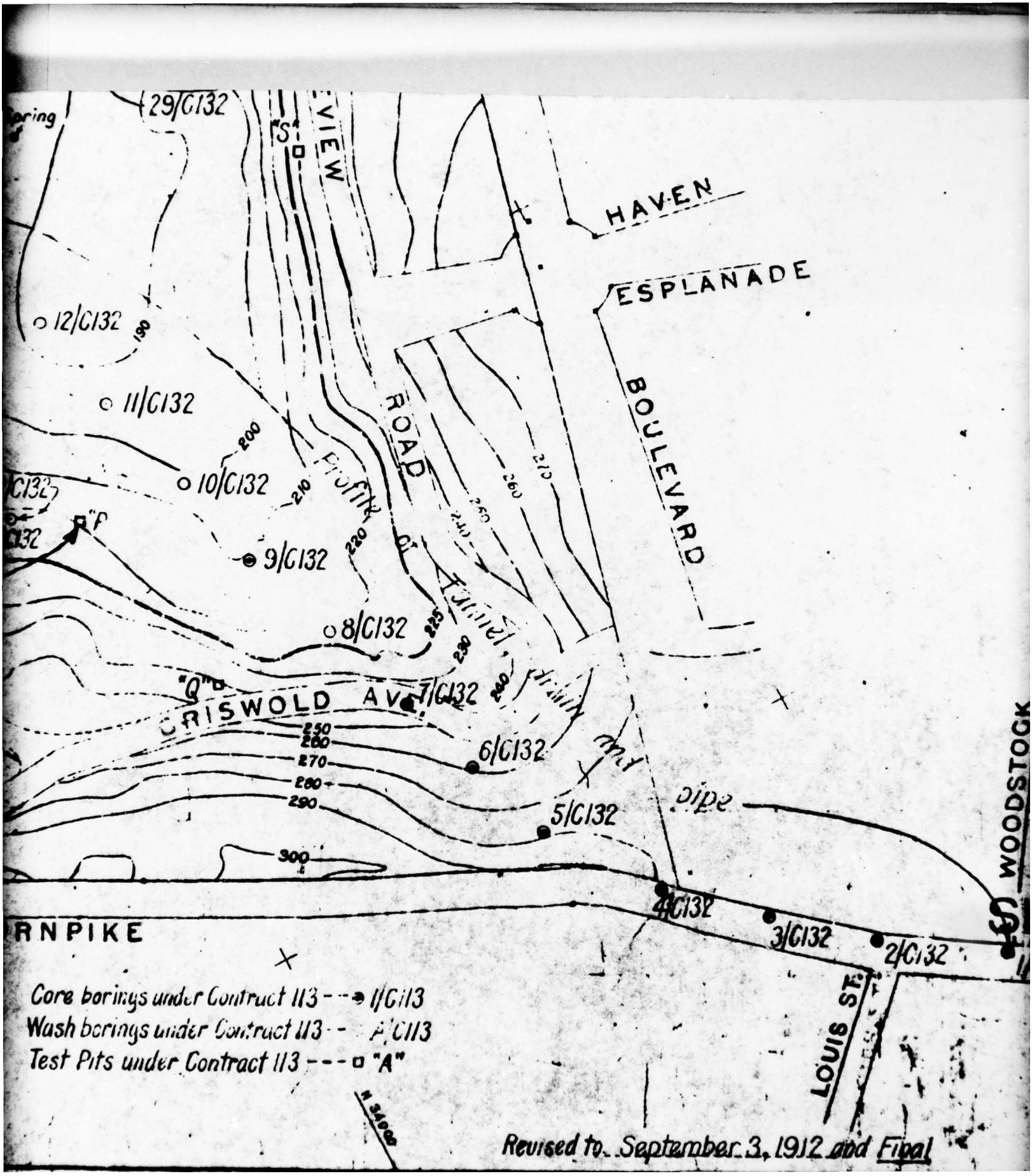

E.13000
N.96000
AVE.
AVE.
BRIGHTON
AVE.
HAVENWOOD
ROAD
BARRETT
Dike (F-F)
10/C113
11/C113
12/C113
13/C132
42/C132
46/C132
32/C132
31/C132
30/C132

E 14000

E 15000


160
170
180
190
200
210
220
225
230
26/C132
28/C132
27/C132
3/C113
4/C113
5/C113
6/C113
7/C113
41/C132
28/C132
B
B
45A
36A
E 14000
E 15000
Core borings under Contract 132
Wash borings under Contract 132


SILVER LAKE
Elevation lake surface on Dec. 18, 1911
= 203.2
3a/C113
E/C113
A/C113
F/C113
B/C113
C/C113
D/C113
Old Foundation
"A"
"B"
"C"
"D"
"J"
"K"
"R"
44/C132
45/C132
49/C132
50/C132
51/C132
52/C132
Profile E-E
RICHMOND
THRESSEA
PL.
EDDY ST.
1/C132
8/C132
Topography based on Richmond Topographical Bureau surveys.
Elevations reduced to Board of Water Supply datum.


29/C132
"S"
VIEW
HAVEN
ESPLANADE
12/C132
11/C132
BOULEVARD
ROAD
10/C132
9/C132
8/C132
"Q"
GRISWOLD AVE.
7/C132
6/C132
5/C132
pipe
WOODSTOCK
4/C132
3/C132
2/C132
LOUIS ST.
RNPIKE
Core borings under Contract 113 ---● 1/C113
Wash borings under Contract 113 -- ○ A/C113
Test Pits under Contract 113 ---□ "A"
N 34000
Revised to September 3, 1912 and Final

City of New York

BOARD OF WATER SUPPLY

ILVER LAKE RESERVOIR

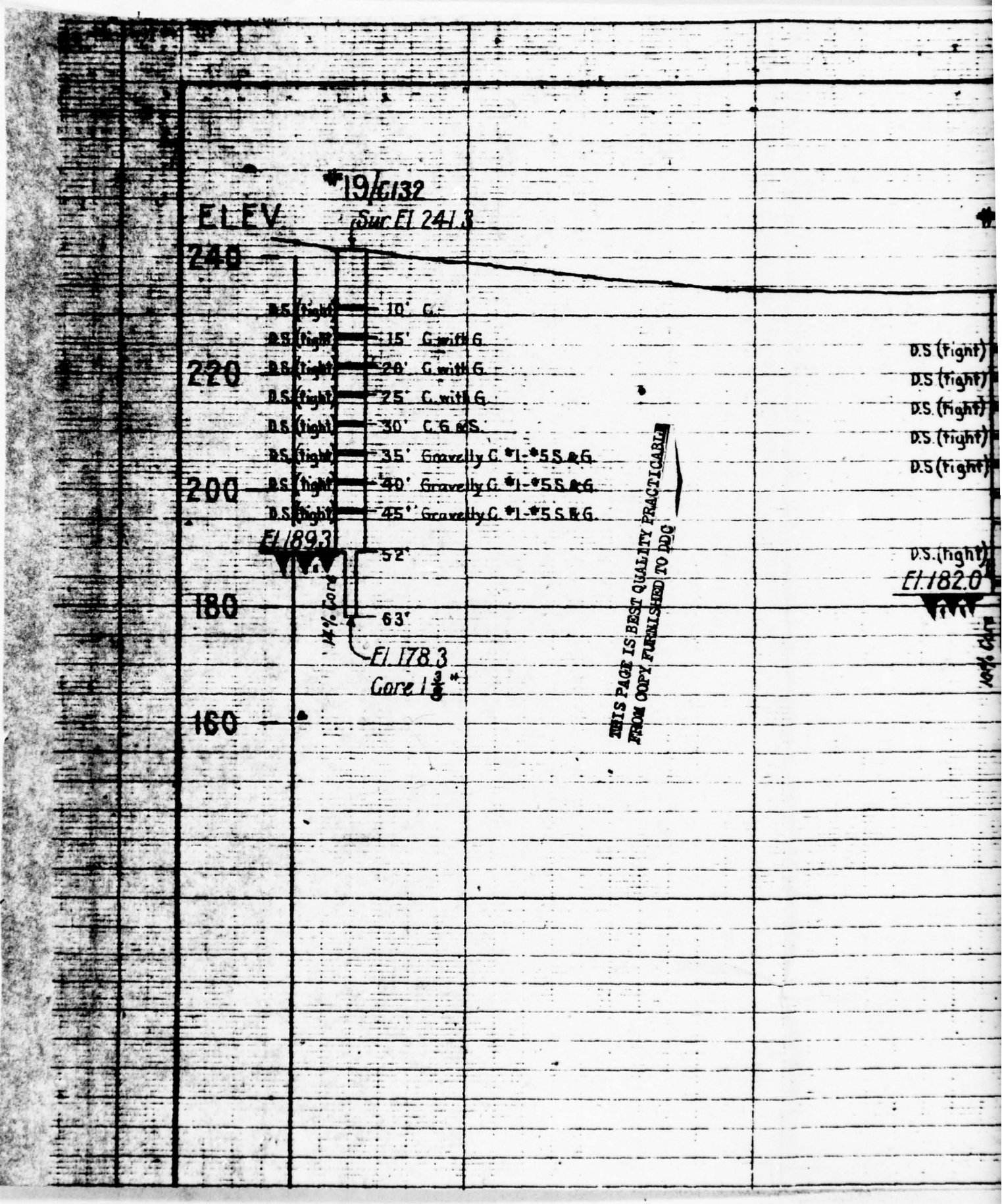
LOCATION PLAN

BORINGS

200 0 200 400 FT.

MAY 22-1912

File Cont. 13/32 G303.1.


*19/C132
Surf El 241.3
ELEV
240
220
200
180
160
D.S (light) 10' C.
D.S (light) 15' C with G.
D.S (light) 20' C with G.
D.S (light) 25' C with G.
D.S (light) 30' C G & S.
D.S (light) 35' Gravelly C. *1-*5 S & G.
D.S (light) 40' Gravelly C. *1-*5 S & G.
D.S (light) 45' Gravelly C. *1-*5 S & G.
El 189.3
52'
4" Core
63'
El 178.3
Core 1 3/8"
D.S (light)
D.S (light)
D.S (light)
D.S (light)
D.S (light)
D.S. (light)
El 182.0
4" Core
THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

#18/6132
Sur El 2340

10' Sandy G.
15' Sandy G.
20' Sandy G. with some #16
25' Clayey #3-#5 S.
30' #3-#6 S. & G.
35' #3-#6 S. & G.
40'
45'
50' Clayey #1-#5 S. & G.
52'
62'

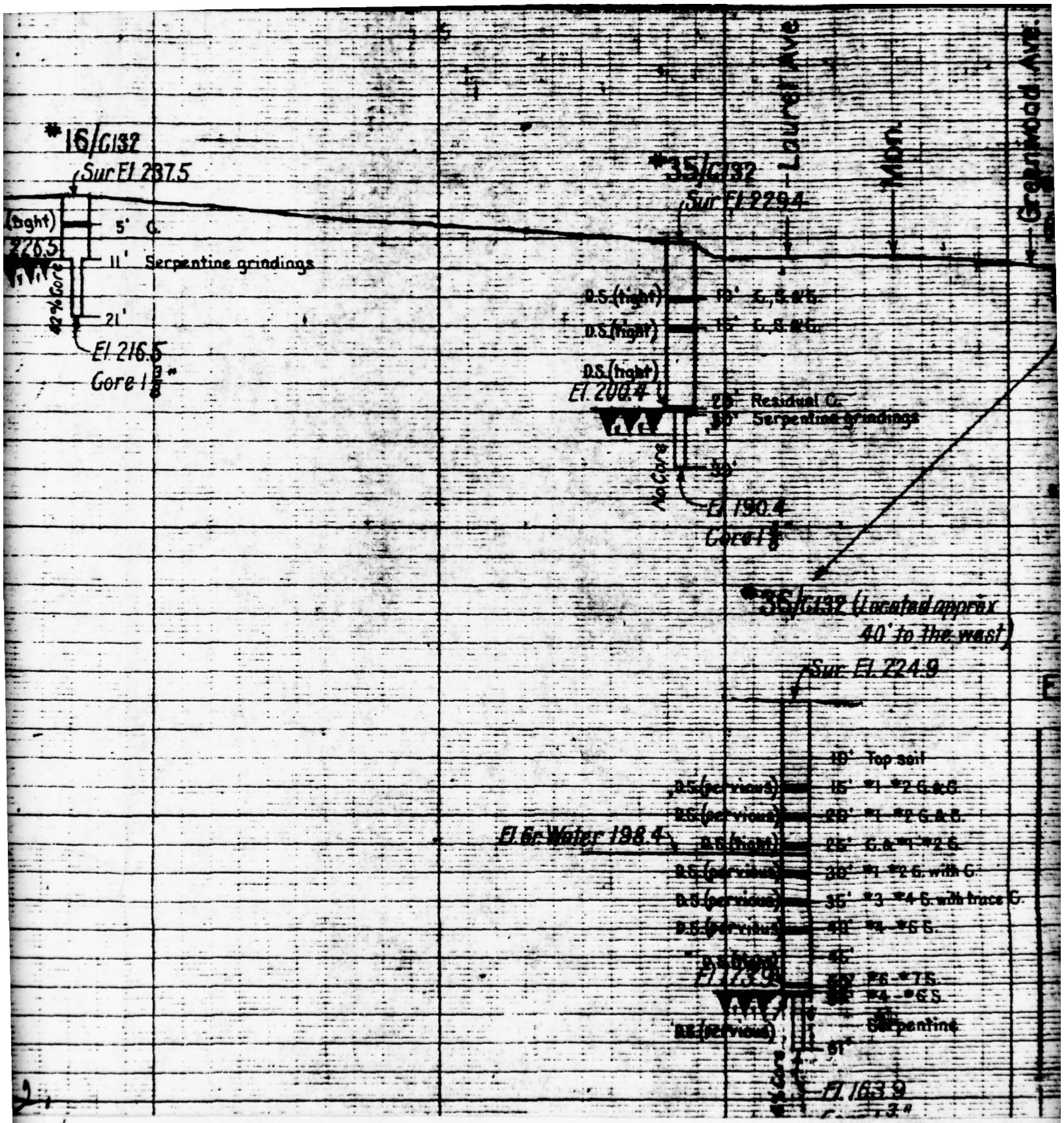
El 1720
Core 1 3/8"

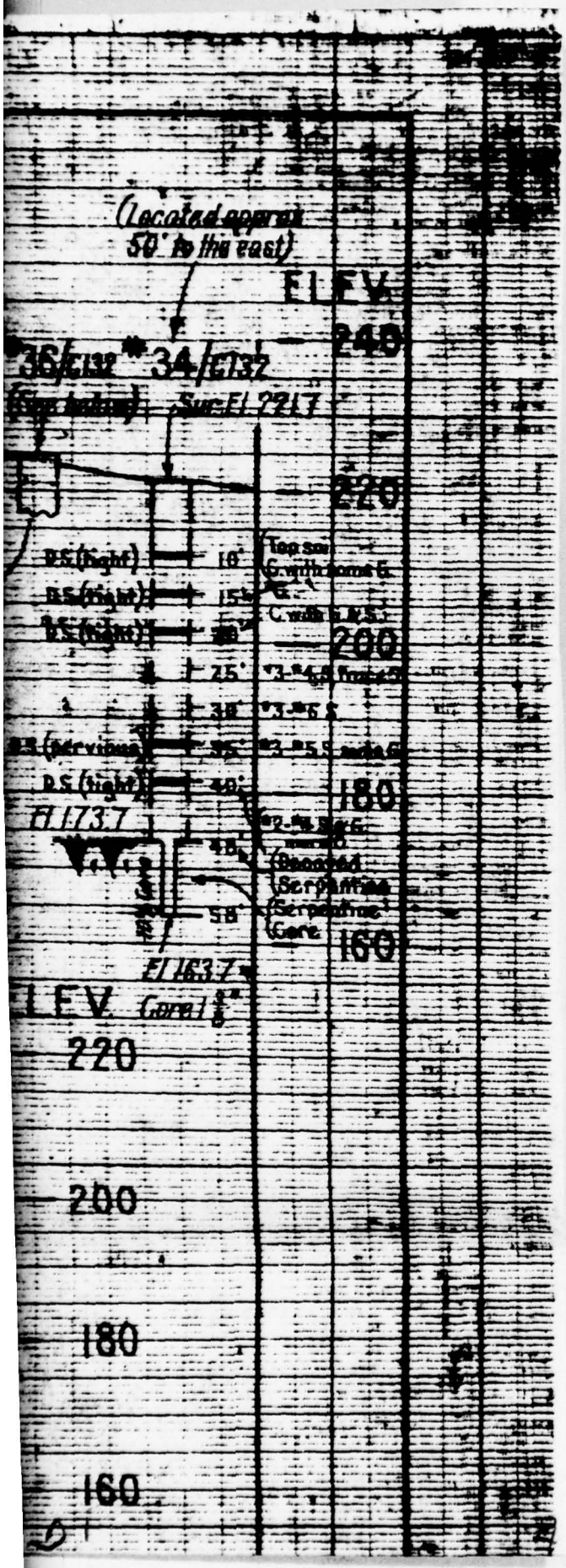
#17/6132
Sur El 2328

D.S. (probably tight) — 12' Clayey G. & S.
D.S. (tight) — 20' Clayey S. & G.
D.S. (tight) — 30' Sandy G.
El 1988
34'
No Core
Serpentine
44'
El 1888
Core 1 3/8"

D.S. (
El

WEST DIKE
(PROFILE C-C)


*16/C132
Sur El 237.5
(light)
276.5
5' C.
11' Serpentine grindings
21'
El 216.5
Gore 1 3/8"
*35/C132
Sur El 229.4
Laurel Ave
Main St
Granada Ave
D.S.(light)
D.S.(light)
D.S.(light)
El 200.4
Residual C.
Serpentine grindings
30'
El 190.4
Gore 1 1/8"
*36/C132 (Located approx 40' to the west)
Sur El 224.9
Top soil
D.S.(previous)
D.S.(previous)
El 6c Water 198.4
D.S.(light)
D.S.(previous)
D.S.(previous)
D.S.(previous)
El 173.9
D.S.(previous)
Serpentine
El 163.9


(located approx
50' to the east)
ELEV.
240
220
200
180
160
36/C132
34/C132
Surf El 221.7
Top Soil
El 173.7
El 163.7
ELEV.
220
200
180
160

ELEV.

230

220

D.S. = Dry Sample

200

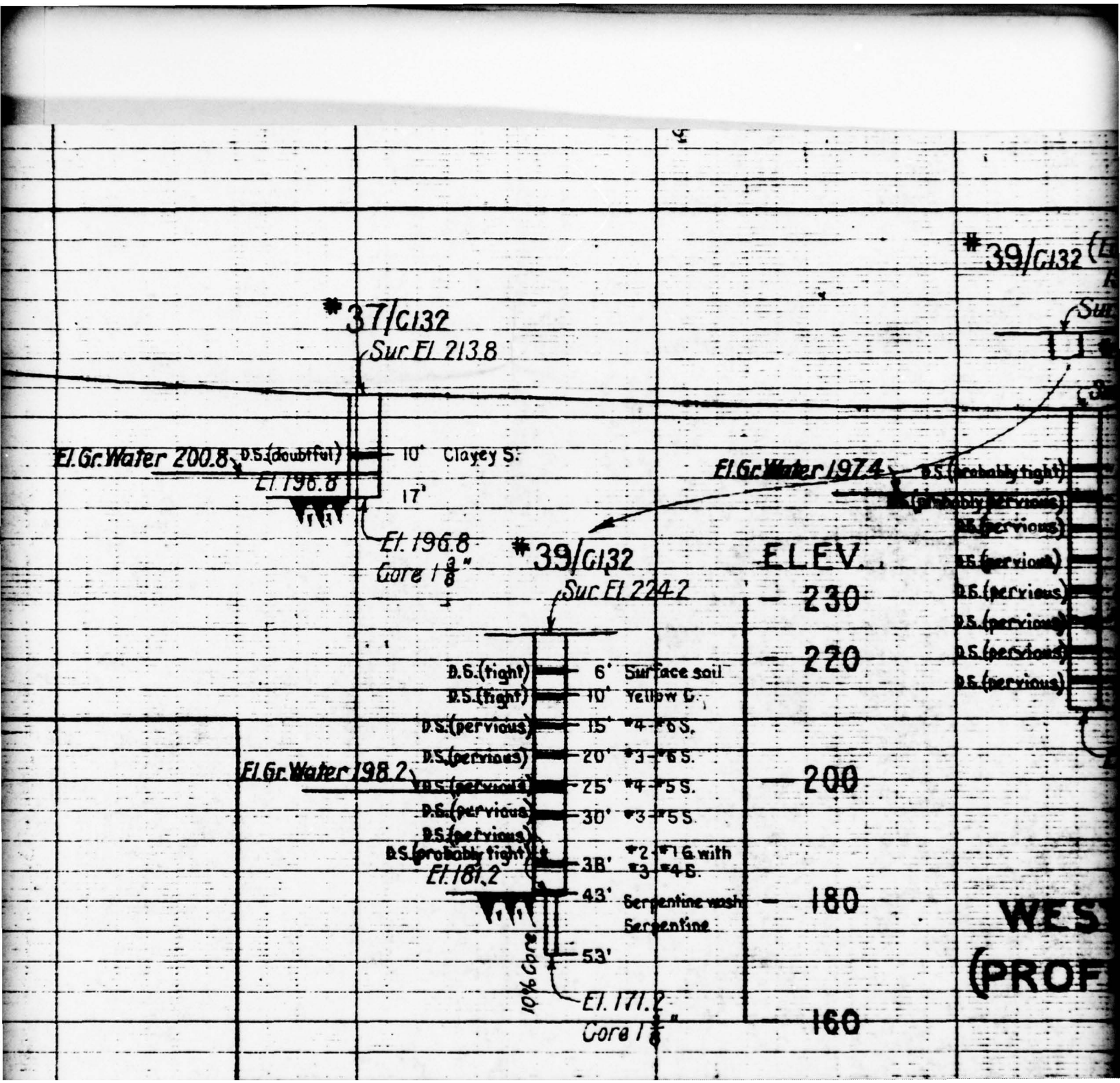
Clay = C
Sand = S
Boulders = B
Gravel = G

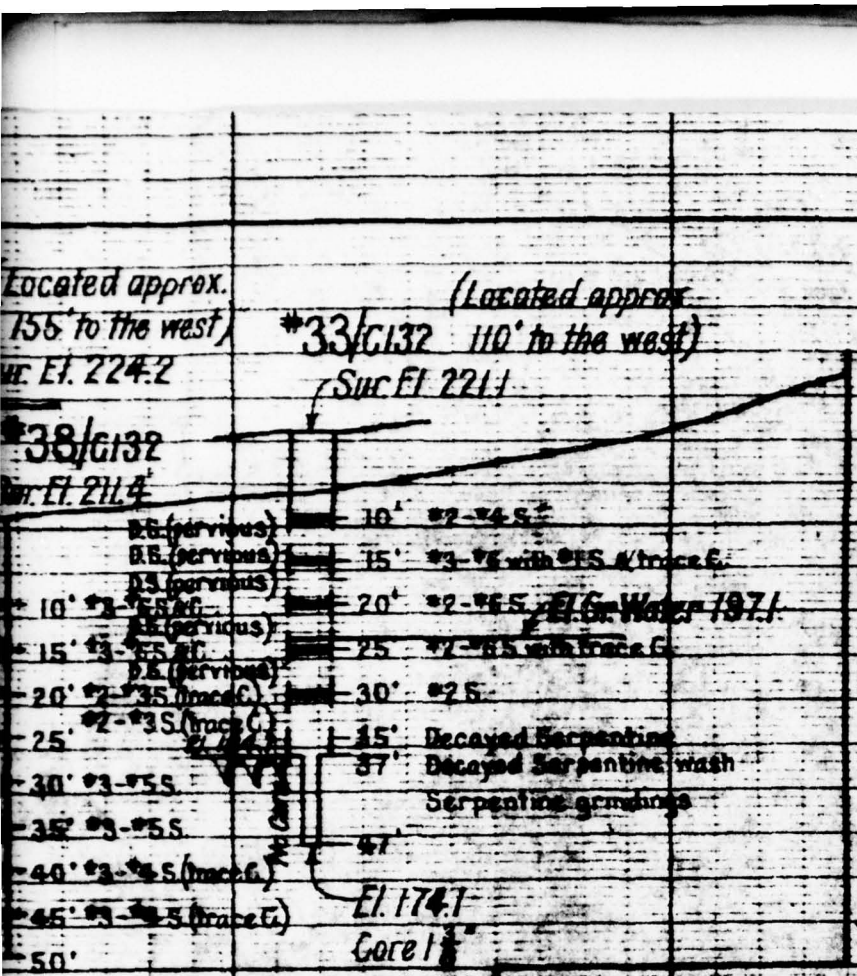
180

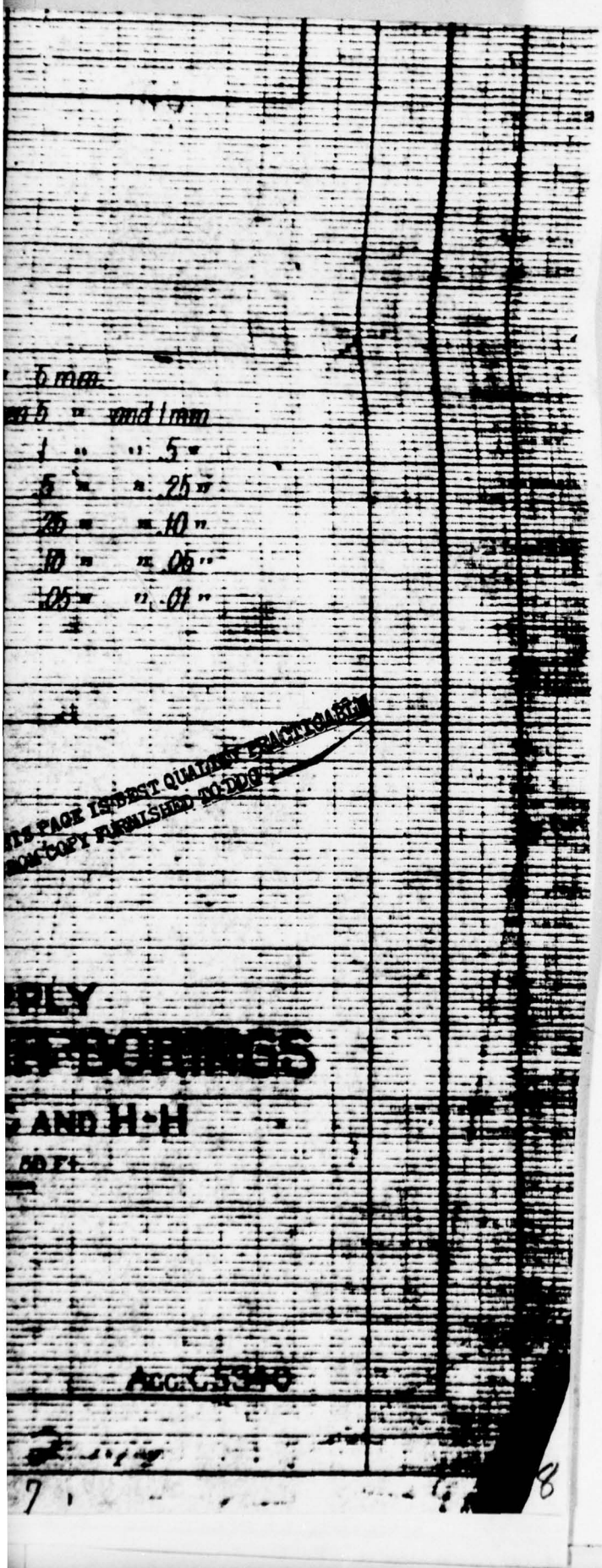
160

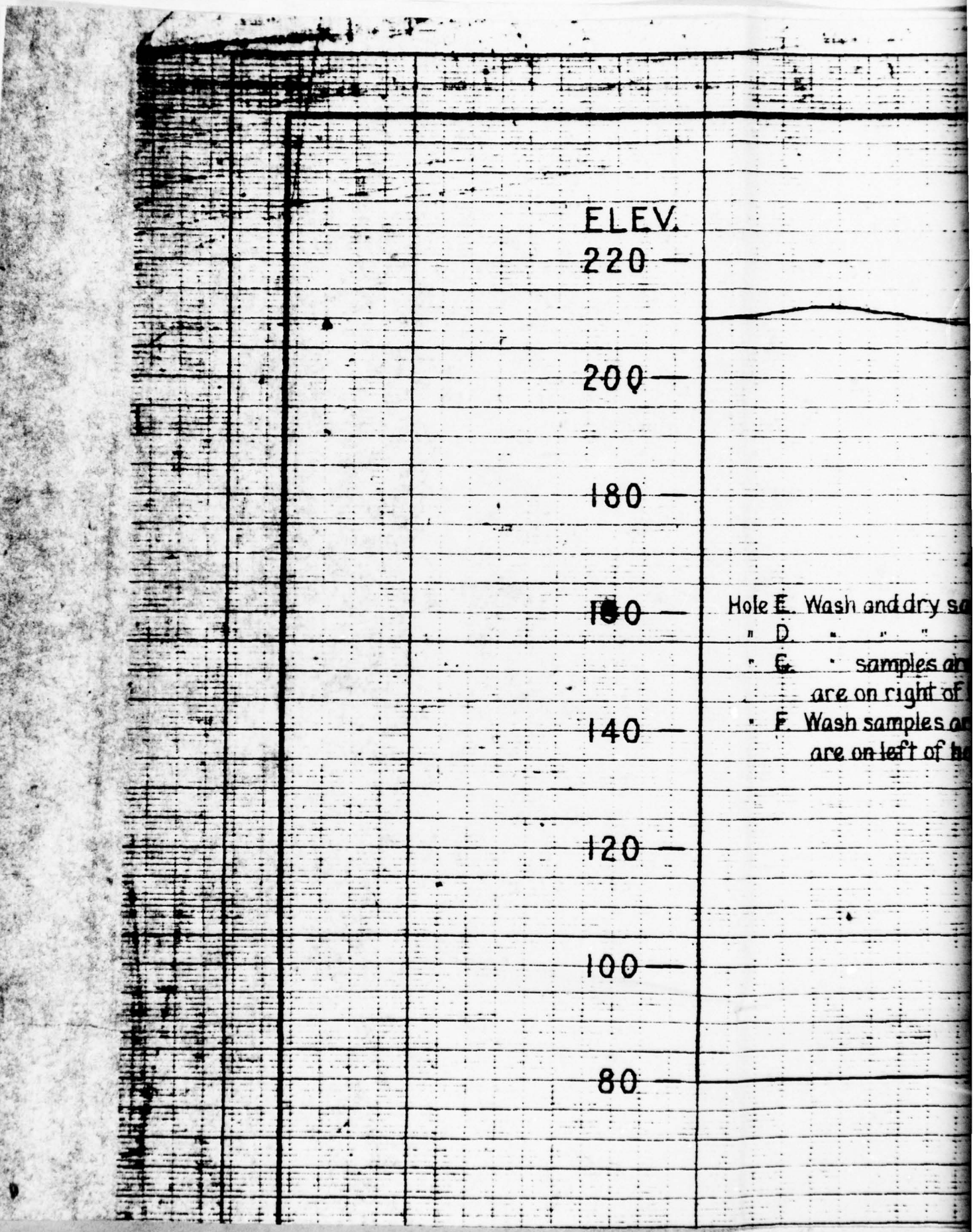
#1 Coarse Gravel	Size above	5 mm.	
#2 Fine Gravel	" between	5 "	and 1 mm.
#3 Coarse Sand	" "	1 "	" .5 "
#4 Medium Sand	" "	.5 "	" .25 "
#5 Fine Sand	" "	.25 "	" .10 "
#6 Superfine Sand	" "	.10 "	" .05 "
#7 Rock flour and clay	" "	.05 "	" .01 "

Formation determined by [illegible]


#37/C132
Sur. El 213.8
El. Gr. Water 200.8
D.S. (doubtful)
10' Clayey S.
El 196.8
17'
El. 196.8
Core 1 3/8"
#39/C132
Sur. El 224.2
D.S. (tight)
6' Surface soil
D.S. (tight)
10' Yellow C.
D.S. (pervious)
15' #4 - #6 S.
D.S. (pervious)
20' #3 - #6 S.
El. Gr. Water 198.2
D.S. (pervious)
25' #4 - #5 S.
D.S. (pervious)
30' #3 - #5 S.
D.S. (pervious)
D.S. (probably tight)
38' #2 - #1 G. with #3 - #4 G.
El. 181.2
43' Serpentine wash Serpentine
53'
10% Core
El. 171.2
Core 1 3/8"
ELEV.
230
220
200
180
160
#39/C132
Sur.
El. Gr. Water 197.4
D.S. (probably tight)
D.S. (probably pervious)
D.S. (pervious)
D.S. (pervious)
D.S. (pervious)
D.S. (pervious)
D.S. (pervious)
D.S. (pervious)
WES
(PROF


Located approx.
155' to the west)
Surf. El. 224.2
#38/C132
Surf. El. 211.4
(Located approx.
110' to the west)
#33/C132
Surf El 221.1
10' #2-#4 S
15' #3-#5 with #1S & trace G
20' #2-#5 El. G. Water 197.1
25' #2-#5 with trace G
30' #2 S
15' Decayed Serpentine
37' Decayed Serpentine wash
Serpentine grindings
47'
El. 174.1
Core 1
B.B. (pervious)
B.B. (pervious)
D.S. (pervious)
B.B. (pervious)
D.S. (pervious)
10' #3-#5 S.G.
15' #3-#5 S.G.
20' #2-#3S (trace G)
25' #2-#3S (trace G)
30' #3-#5 S.
35' #3-#5 S.
40' #3-#5 (trace G)
45' #3-#5 (trace G)
50'
El. 161.4
ELEV.
230
220
200
180
160
#1 Coarse Gravel Size above
#2 Fine Gravel " between
#3 Coarse Sand " "
#4 Medium Sand " "
#5 Fine Sand " "
#6 Superfine Sand " "
#7 Rock flour and clay " "
City of New York
BOARD OF WATER SUPP
SILVER LAKE RESERVOI
T. DIKE
ILE H-H)


5 mm.
.5 " mm
1 " " .5 "
5 " " .25 "
25 " " .10 "
10 " " .05 "
05 " " .01 "
AND H-H
ACC. C.5340

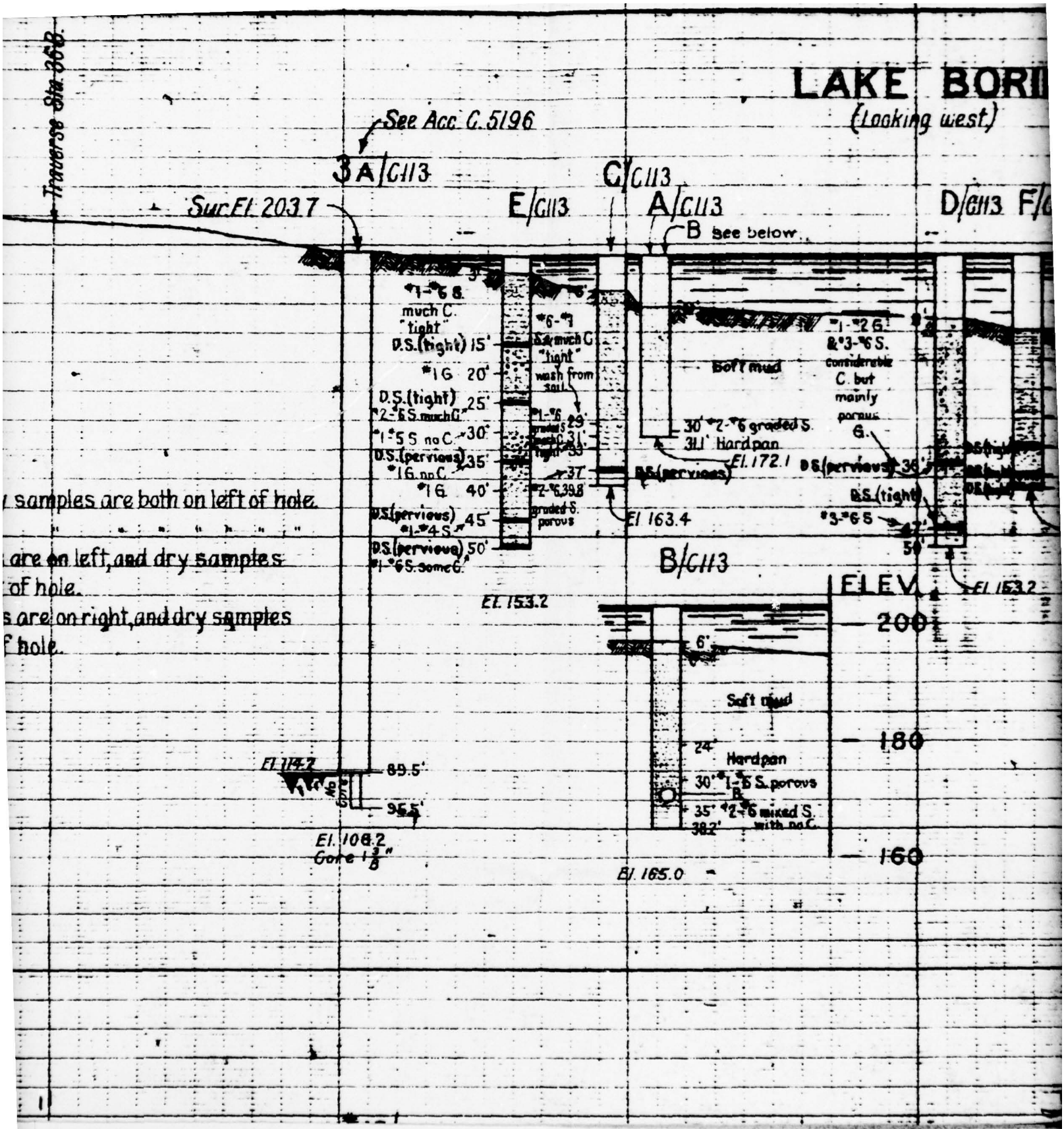

ELEV.
220
200
180
160
140
120
100
80
Hole E. Wash and dry sa
" D " " "
" E " samples ar
are on right of
" F Wash samples a
are on left of h

Traverse Sta. 36B.

LAKE BORI

(Looking west)

See Acc. C. 5196



samples are both on left of hole.

are on left, and dry samples
of hole.

s are on right, and dry samples
f hole.

13'

Bottom of Lake

18' Impalpable lake muck

23' Impalpable lake muck

28' Impalpable lake muck with trace G

33' Tight G with trace of muck

38' Tight G with trace of G

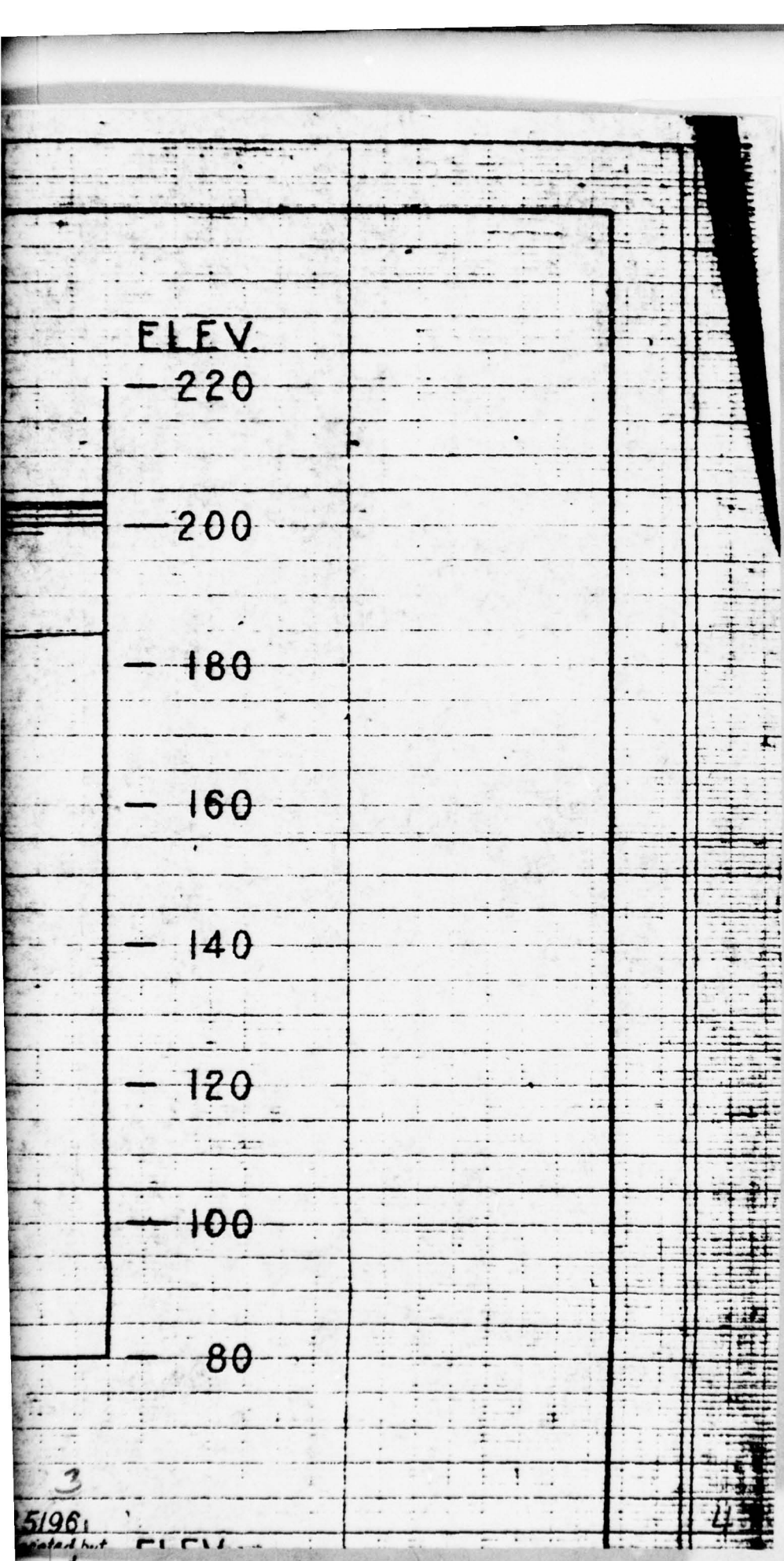
40' Clayey S & G all sizes probably tight

El 163.2'

#15/C132

See Acc C.5

#4/C132 (Located approx 40' to the north)


ELEV.
220
200
180
160
140
120
100
80

ELEV.

240 —

220 —

200 —

180 —

160 —

140 —

Samples indic
and for deter
reliable than
on left of hol

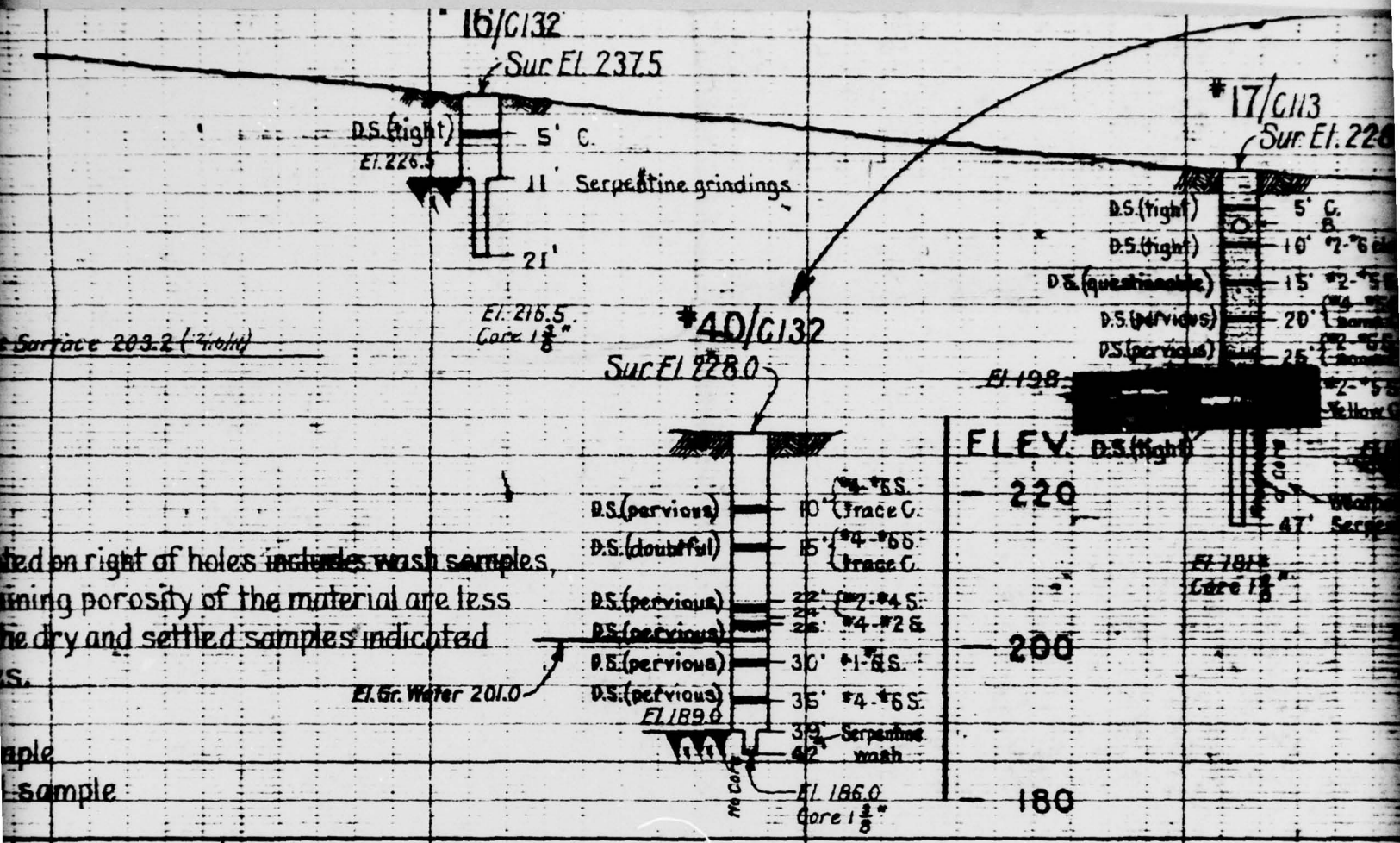
D.S. = Dry so
S.S. = Settle

#1 Coarse Gravel
#2 Fine Gravel
#3 Coarse Sand
#4 Medium Sand
#5 Fine Sand
#6 Superfine Sand
#7 Rock Flour and cla

Clay = C
Sand = S
Boulders = B
Gravel = G

Drawn by
Traced by
Checked by
Formation determined by

5



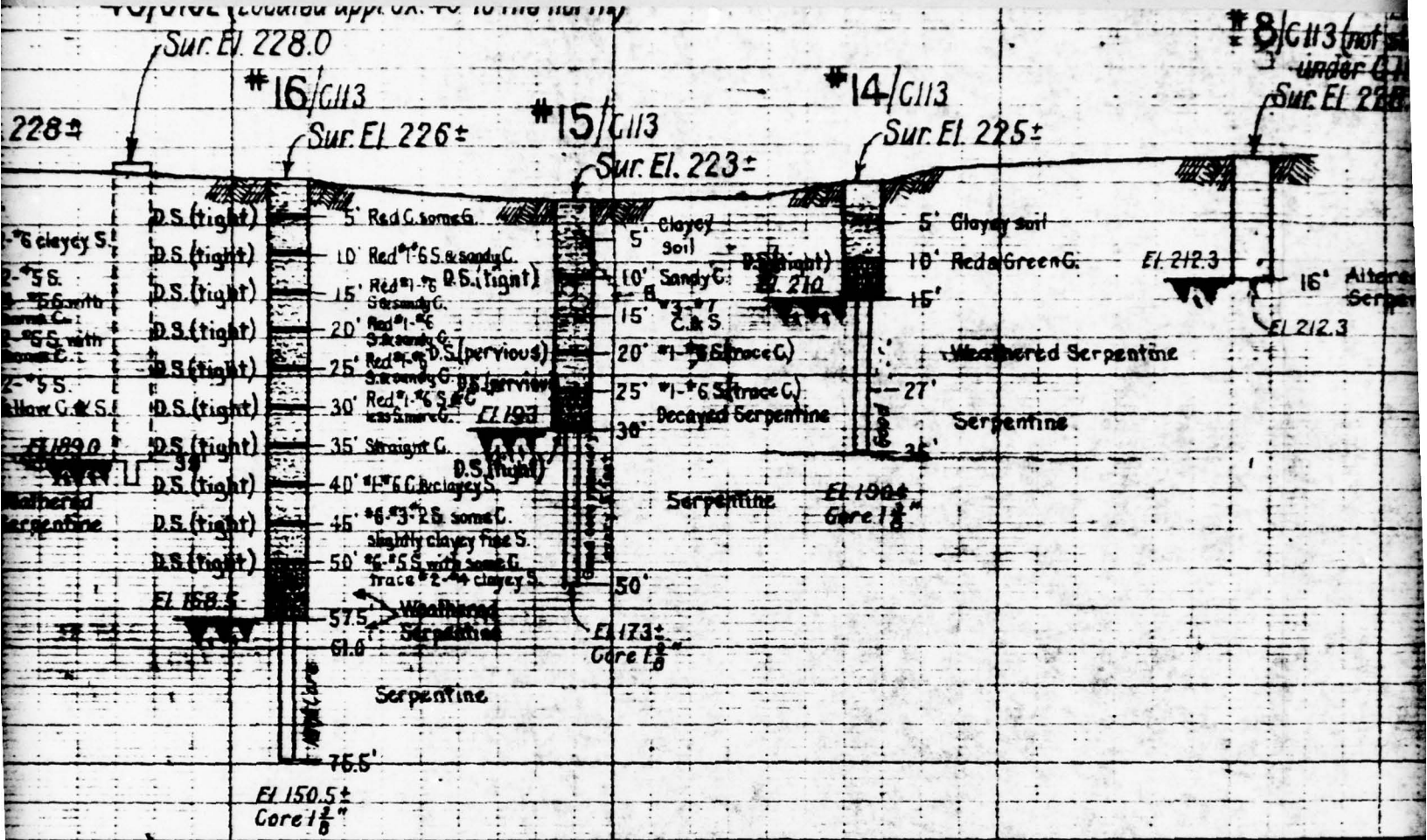
...ted on right of holes ~~includes wash samples~~,
...ining porosity of the material are less
...he dry and settled samples indicated
...s.

...aple
... sample

Size above 5 mm
" between 5 mm and 1 mm
" " 1 " " .5
" " .5 " " .25
" " .25 " " .10
" " .10 " " .05
" " .05 " " .01

WEST DIKE
(PROFILE D-D

for plan locations see A



E (Looking west)

-D)

City of N

BOARD OF WA

SILVER LAKE RES

ROFILE ON CENTER LIN

LAKE BORINGS A

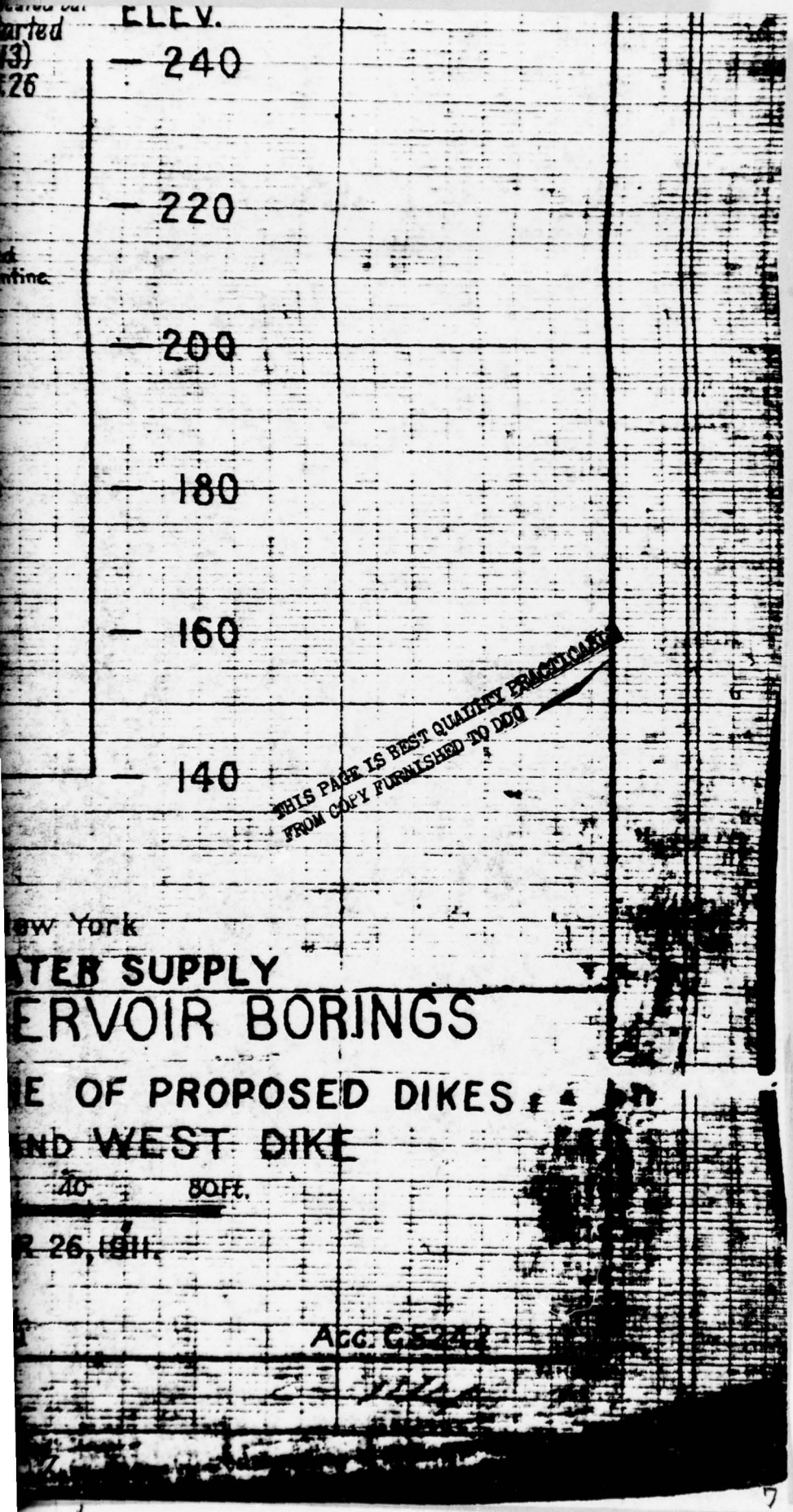
40 0

DECEMBE

Revised to May 1st 1912, for Cont. 113 only

Acc. C5311

File Cont. 113 192 G. C.O S



New York

STER SUPPLY

ERVOIR BORINGS

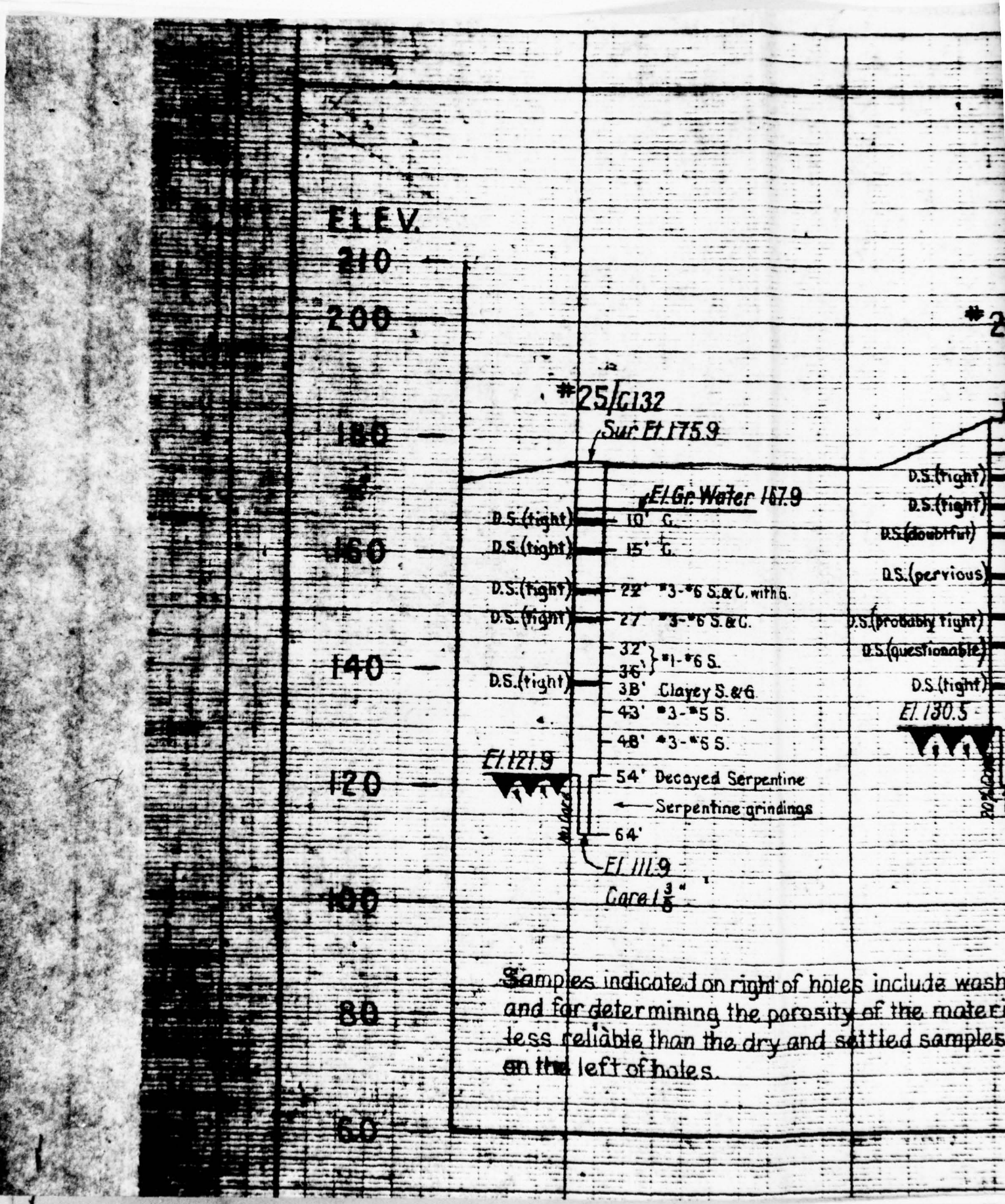
E OF PROPOSED DIKES

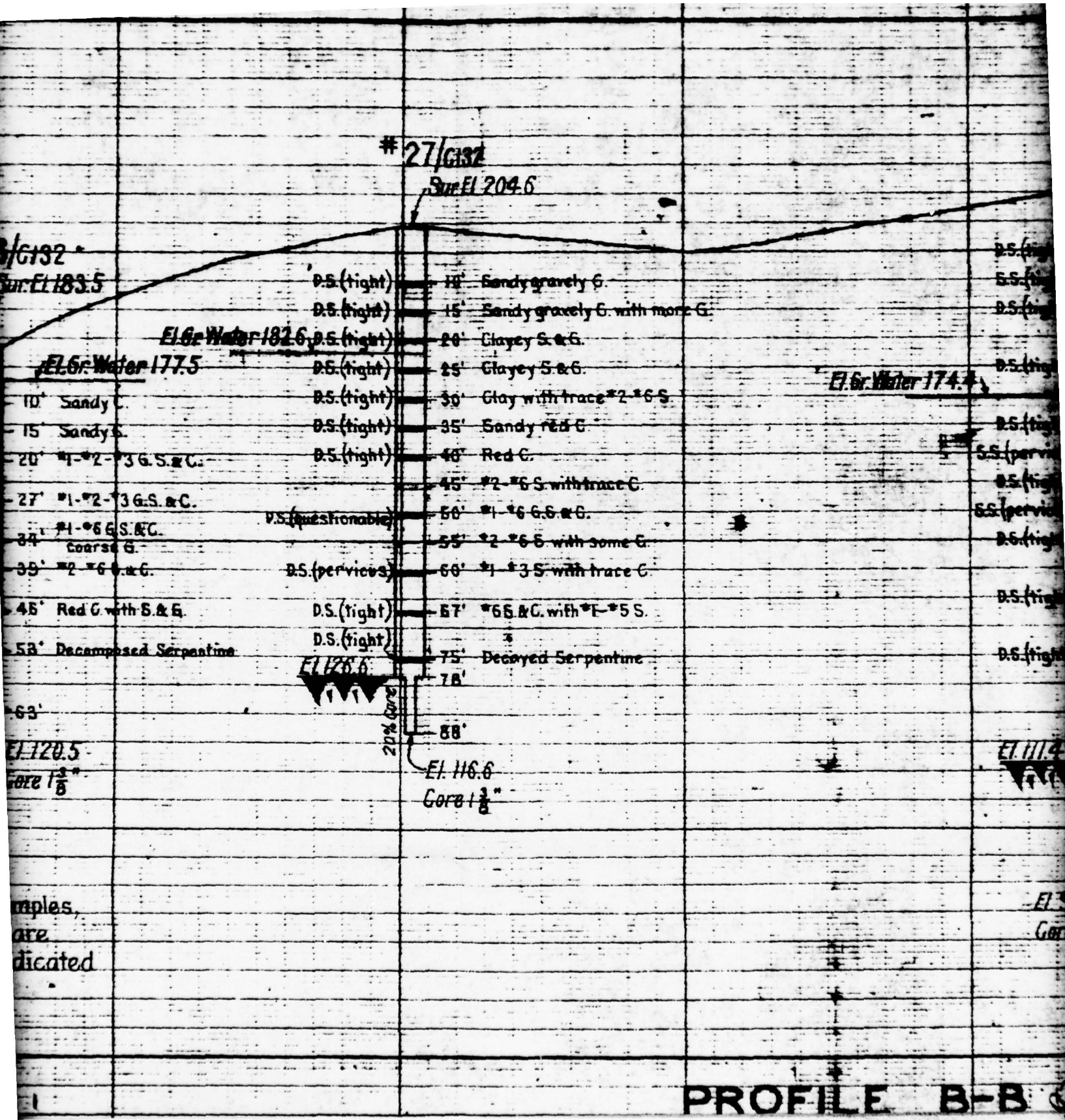
ND WEST DIKE

40 80 Ft.

R 26, 1911.

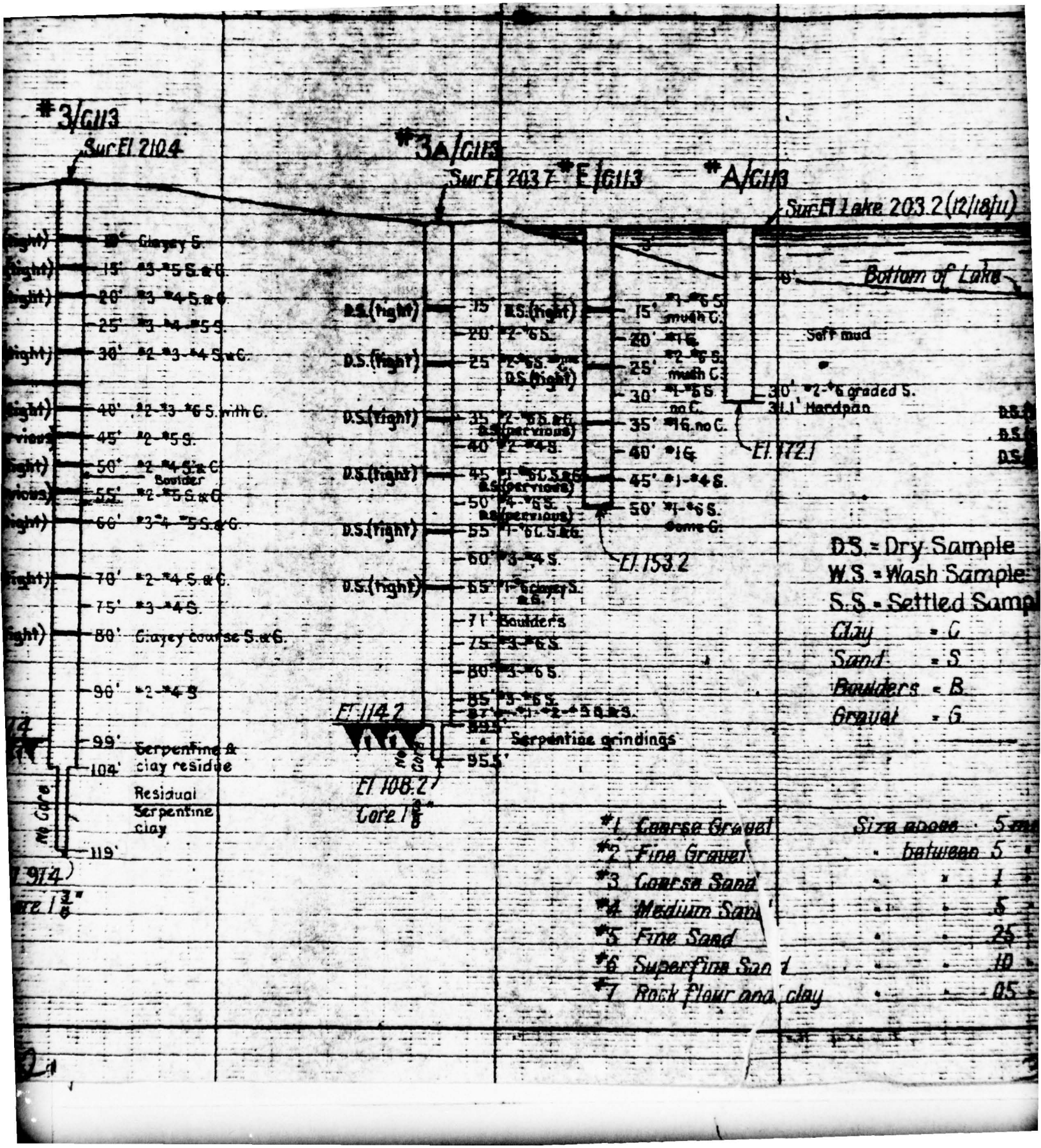
Acc. GS24?

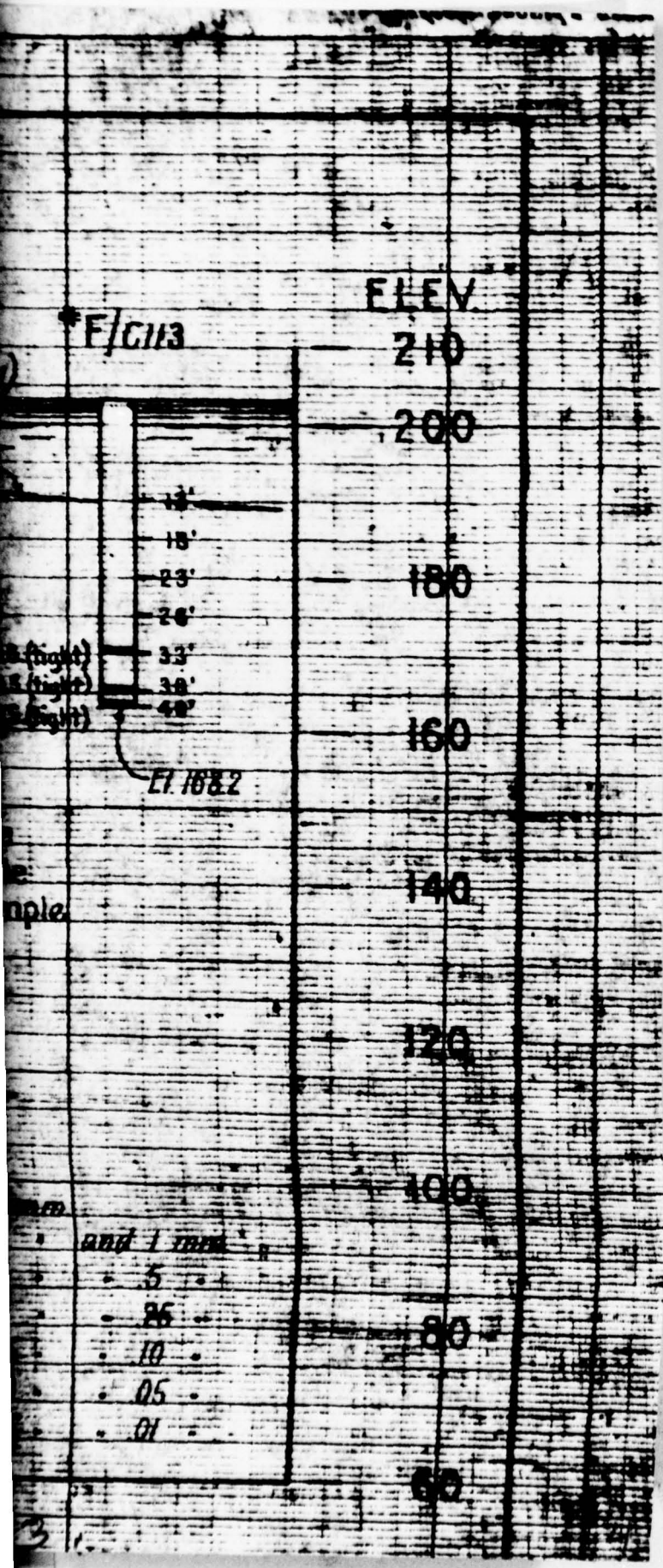

ELEV.
210
200
180
160
140
120
100
80
60
#25/C132
Sur. El. 175.9
El. Gr. Water 167.9
D.S. (tight)
10' C.
D.S. (tight)
15' C.
D.S. (tight)
22' #3-#6 S. & C. with G.
D.S. (tight)
27' #3-#6 S. & C.
32'
36'
#1-#6 S.
D.S. (tight)
38' Clayey S. & G.
43' #3-#5 S.
48' #3-#5 S.
El. 121.9
54' Decayed Serpentine
Serpentine grindings
64'
El. 111.9
Core 1 3/8"
D.S. (tight)
D.S. (tight)
D.S. (doubtful)
D.S. (pervious)
D.S. (probably tight)
D.S. (questionable)
D.S. (tight)
El. 130.5
Samples indicated on right of holes include wash s
and for determining the porosity of the materia
less reliable than the dry and settled samples i
on the left of holes.

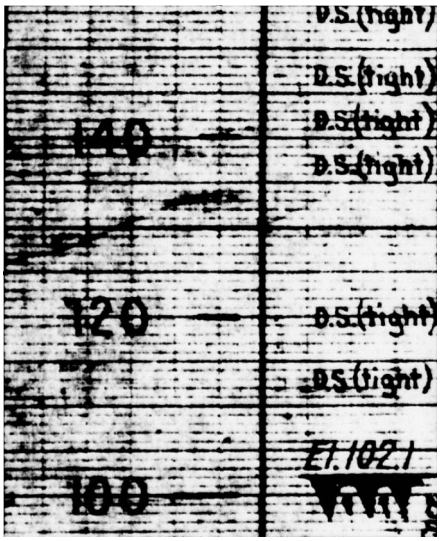


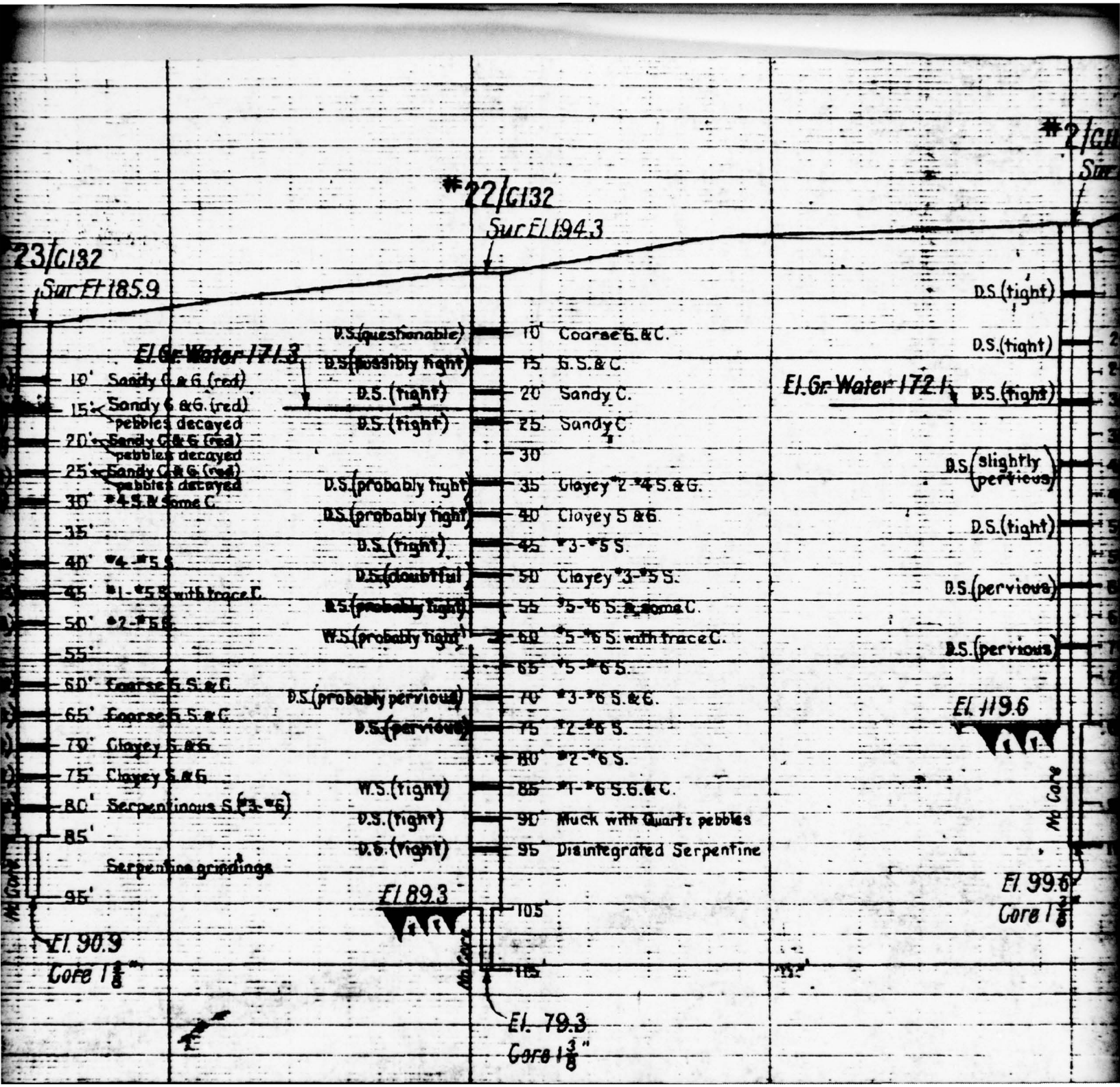
mples,
are
dicated

PROFILE B-B


#3/G113
Sur El 210.4
#3A/G113
Sur El 203.7
#E/G113
#A/G113
Sur El Lake 203.2 (12/18/41)
Bottom of Lake
Soft mud
30' #2-#6 graded S.
31.1' Hardpan
El 172.1
El 153.2
D.S. = Dry Sample
W.S. = Wash Sample
S.S. = Settled Sample
Clay = C
Sand = S
Boulders = B
Gravel = G
#1 Coarse Gravel
#2 Fine Gravel
#3 Coarse Sand
#4 Medium Sand
#5 Fine Sand
#6 Superfine Sand
#7 Rock flour and clay
Size passes 5 mm
between 5 "
" 1 "
" .5 "
" .25 "
" .10 "
" .05 "
Boulder
Serpentine & clay residue
Residual Serpentine clay
Serpentine grindings
El 108.2
Core 1 3/8"
No Core


F/C113
ELEV.
210
200
180
160
140
120
100
80
60
El. 168.2
and 1 mm


D.S.(right)
D.S.(right)
D.S.(right)
D.S.(right)
140
120
D.S.(right)
D.S.(right)
El.102.1
100


#23/C132
Sur El 185.9
El. Gr. Water 171.3
10' Sandy G & G (red)
15' Sandy G & G (red) pebbles decayed
20' Sandy G & G (red) pebbles decayed
25' Sandy G & G (red) pebbles decayed
30' #4 S. & Some C.
35'
40' #4-#5 S.
45' #1-#5 S. with trace C.
50' #2-#5 S.
55'
60' Coarse G. S. & C.
65' Coarse G. S. & C.
70' Clayey S. & G.
75' Clayey S. & G.
80' Serpentinous S. (#3-#6)
85'
Serpentine grindings
95'
El. 90.9
Core 1 3/8"
#22/C132
Sur El. 194.3
D.S. (questionable)
D.S. (possibly tight)
D.S. (tight)
D.S. (tight)
10' Coarse G. & C.
15' G. S. & C.
20' Sandy C.
25' Sandy C.
30'
D.S. (probably tight)
D.S. (probably tight)
D.S. (tight)
D.S. (doubtful)
D.S. (probably tight)
W.S. (probably tight)
35' Clayey #2-#4 S. & G.
40' Clayey S. & G.
45' #3-#5 S.
50' Clayey #3-#5 S.
55' #5-#6 S. & some C.
60' #5-#6 S. with trace C.
65' #5-#6 S.
D.S. (probably pervious)
D.S. (pervious)
70' #3-#6 S. & G.
75' #2-#6 S.
80' #2-#6 S.
W.S. (tight)
D.S. (tight)
D.S. (tight)
85' #1-#6 S. G. & C.
90' Muck with Quartz pebbles
95' Disintegrated Serpentine
El 89.3
105'
115'
El. 79.3
Core 1 3/8"
#2/C
Sur
D.S. (tight)
D.S. (tight)
El. Gr. Water 172.1
D.S. (tight)
D.S. (slightly pervious)
D.S. (tight)
D.S. (pervious)
D.S. (pervious)
El. 119.6
El. 99.6
Core 1 3/8"

/C113

Sur El 202.6

Sur El Lake 203.2 (approx)

Boulders

12' Clayey S.

20' Clayey #3-#6 S. & G.

25' #1-#6 S. with trace C.

30' #3-#5 S. & G.

35' #2-#5 S. & G.

40' #1 & #4-#5 S. & G.

45' #2-#4 G. & S. with trace C.

50' #4-#5 S. with trace G.

55' #1-#2 G. & #4-#6 S.

60' #2-#4 S. & G.

65' #1-#4 S. & G.

70' #2-#4 S.

75' #6-#4 S.

83' Serpentine grindings

96' Weathered Serpentine.

103'

100

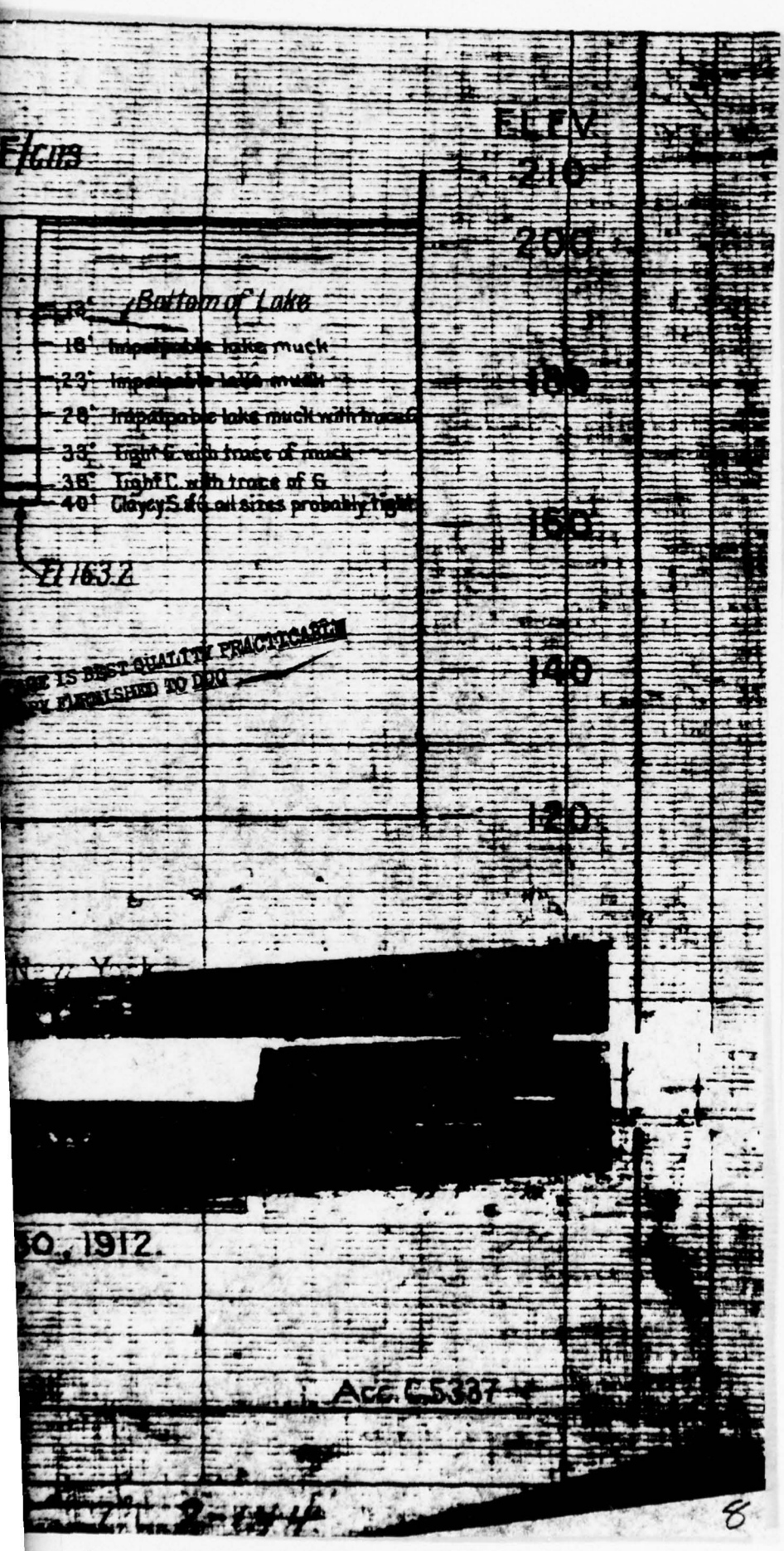
60

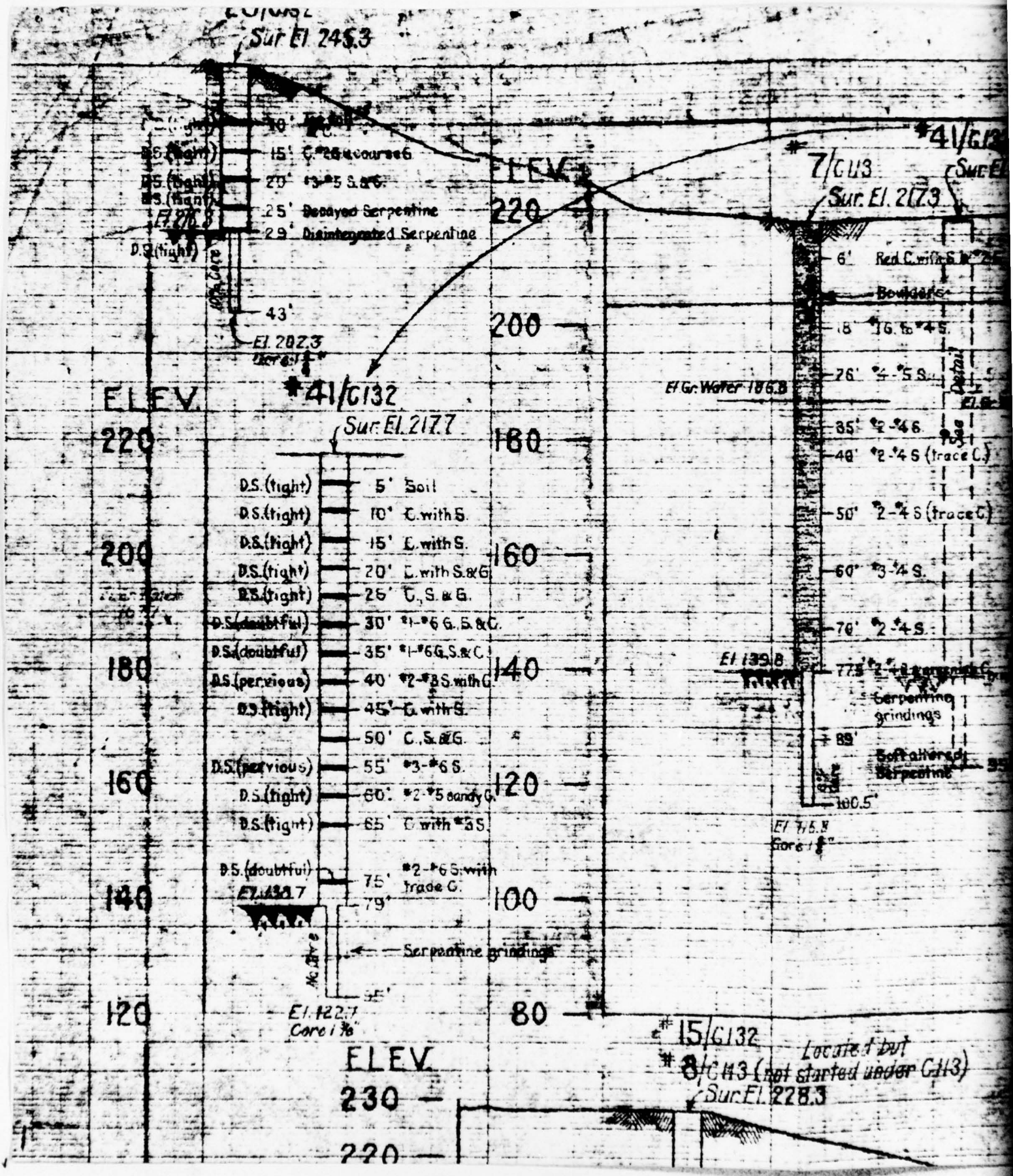
JULY 30

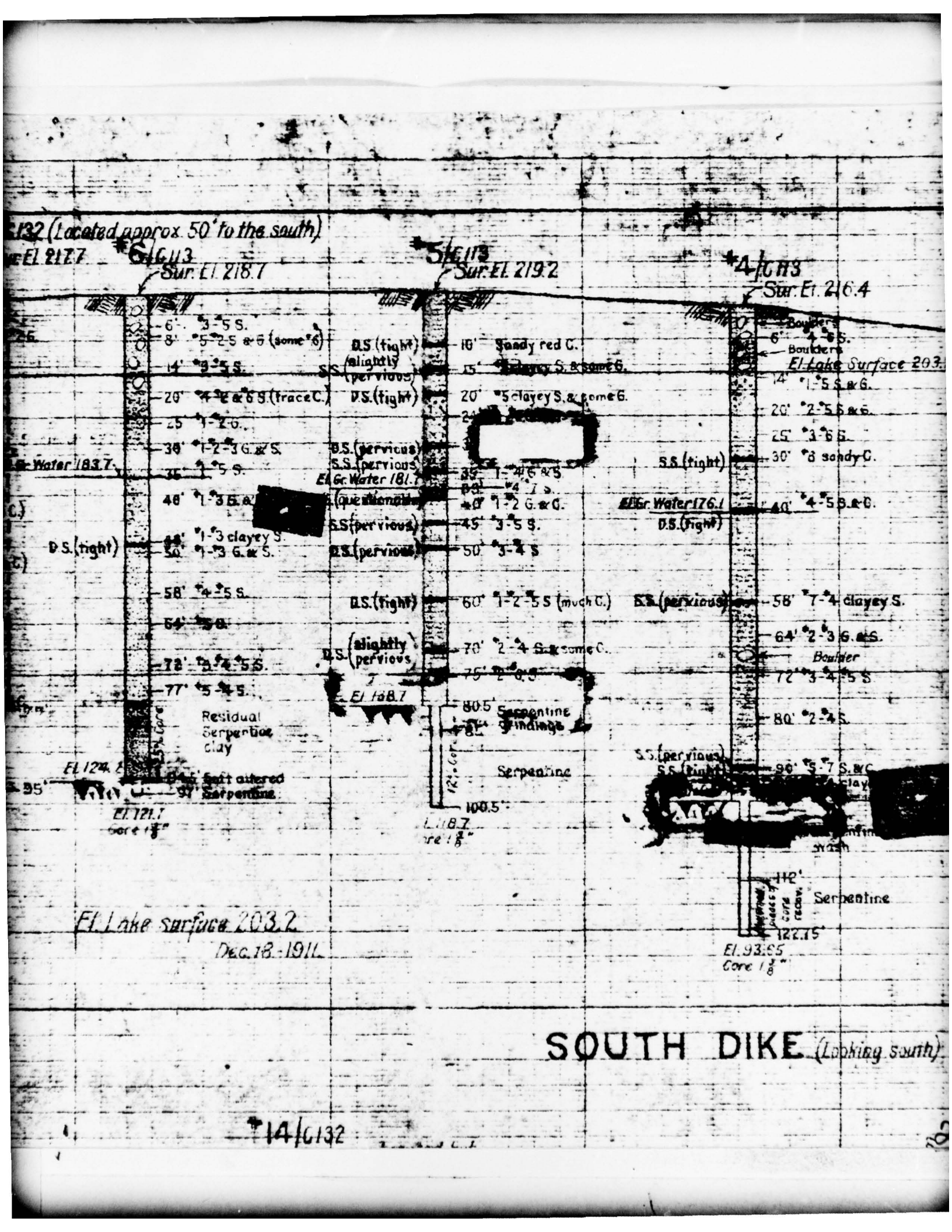
A

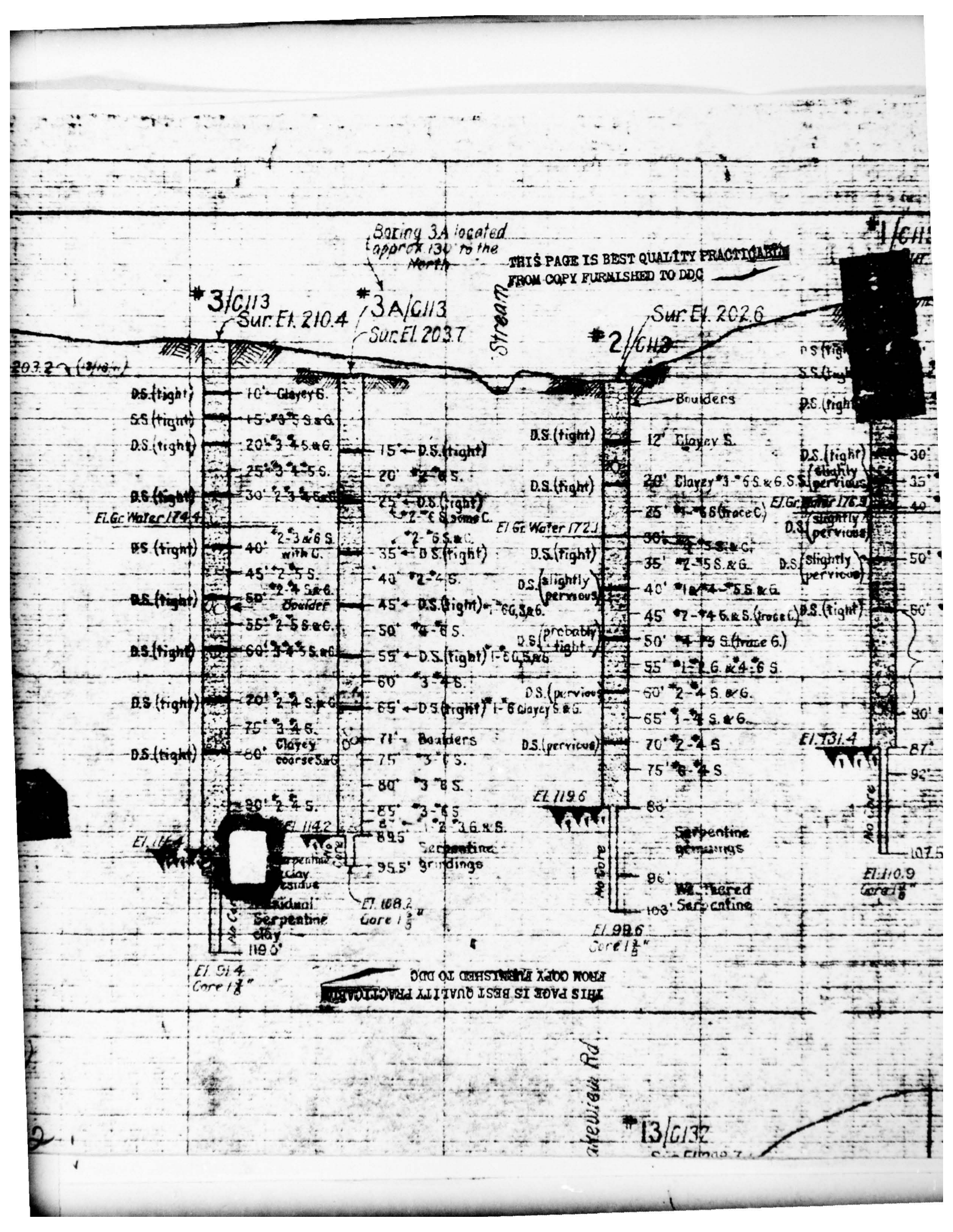
Acc C 53H

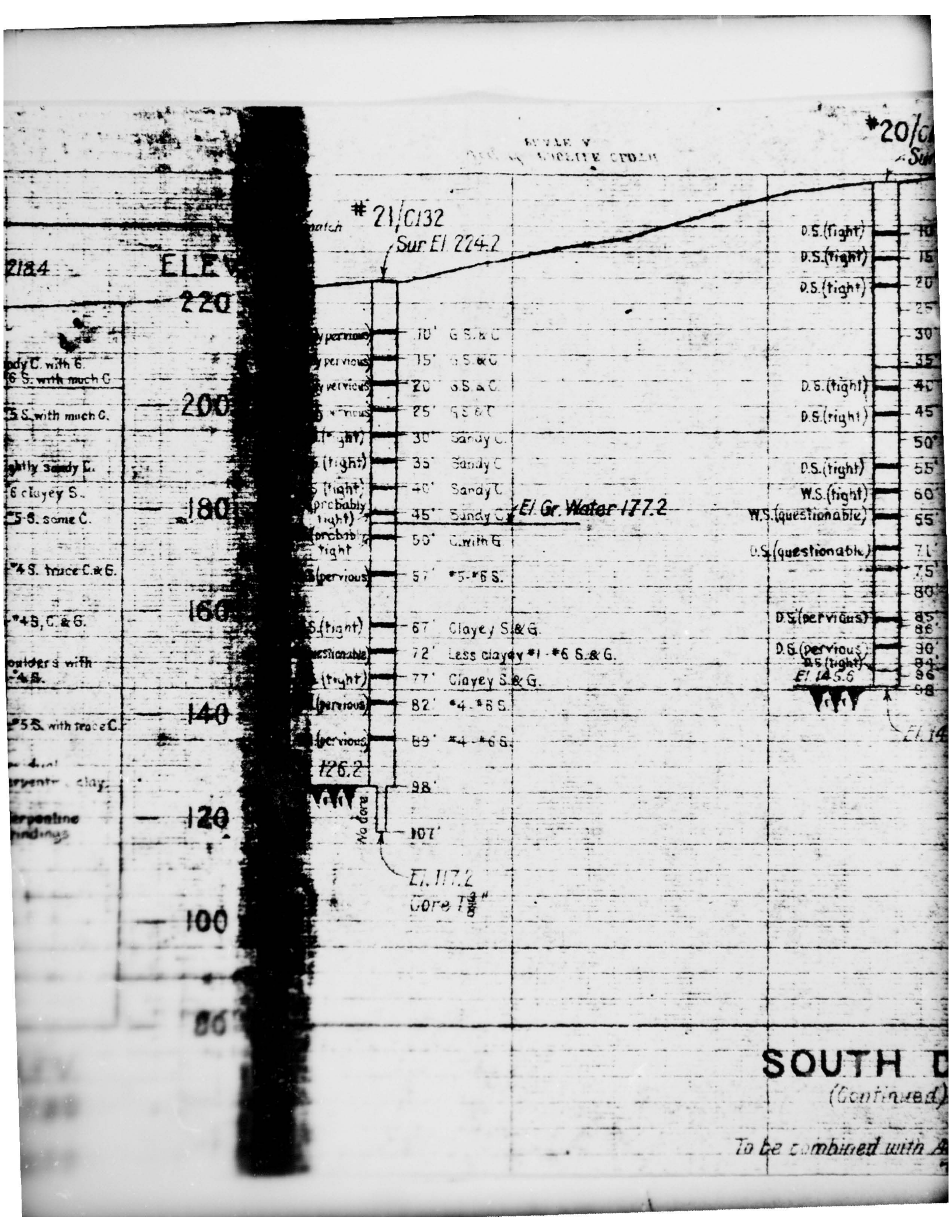
File Cost


ELEV.
210
200
190
180
170
160
150
140
130
120
Bottom of Lake
18' Impalpable lake muck
23' Impalpable lake muck
28' Impalpable lake muck with trace of
33' Light G. with trace of muck
38' Light C. with trace of G.
40' Clayey S. fg. at sizes probably light
63.2
IS BEST QUALITY PRACTICABLE
FURNISHED TO DDC
York
30, 1912.
Acc. C5387
8


Sur El 245.3
10' C.
15' C. *2 & course 6
20' *3-*5 S. & G.
25' Decayed Serpentine
29' Disintegrated Serpentine
43'
El 202.3
Core 1"
D.S. (light)
D.S. (light)
D.S. (light)
D.S. (light)
El 216.3
D.S. (light)
No Core
ELEV.
220
200
180
160
140
120
#41/C132
Sur El 217.7
D.S. (light) 5' Soil
D.S. (light) 10' C. with S.
D.S. (light) 15' C. with S.
D.S. (light) 20' C. with S. & G.
D.S. (light) 25' C., S. & G.
D.S. (doubtful) 30' *1-*6 G., S. & C.
D.S. (doubtful) 35' *1-*6 G., S. & C.
D.S. (pervious) 40' *2-*8 S. with G.
D.S. (light) 45' C. with S.
50' C., S. & G.
D.S. (pervious) 55' *3-*6 S.
D.S. (light) 60' *2-*5 sandy C.
D.S. (light) 65' C. with *3 S.
D.S. (doubtful) 75' *2-*6 S. with trace C.
El 132.7 79'
Serpentine grindings
No Core
El 122.7
Core 1"
ELEV.
230
220
200
180
160
140
120
100
80
#7/C113
Sur El 207.3
6' Red C. with S. & *2
Boulders
18' *6 to *4 S.
26' *4-*5 S.
El Gr. Water 186.8
35' *2-*4 S.
40' *2-*4 S. (trace C.)
50' *2-*4 S. (trace C.)
60' *3-*4 S.
70' *2-*4 S.
El 139.8
77.5' *2-*8 Serpentine G.
Serpentine grindings
89'
Soft altered Serpentine
100.5'
El 115.8
Core 1"
#15/C132
#8/C113 (not started under C113)
Sur El 228.3
Located but


132 (Located approx. 50' to the south)
El. 217.7
6/C113
Sur. El. 218.7
5/C113
Sur. El. 219.2
4/C113
Sur. El. 216.4
6' 3-5 S.
8' 5-2-5 & 6 (some 6)
14' 3-5 S.
20' 4-2 & 6 S (trace C.)
25' 1-2 G.
30' 1-2-3 G. & S.
Water 183.7
35' 3-5 S.
40' 1-3 S. & G.
45' 1-3 clayey S.
D.S. (tight)
50' 1-3 G. & S.
58' 4-5 S.
64' 5 G.
72' 3-4-5 S.
77' 5-4-5 S.
Residual Serpentine clay
El. 124.8
Soft altered Serpentine
El. 121.1
Core 1 3/8"
D.S (tight)
slightly pervious
10' Sandy red C.
15' Clayey S. & some G.
D.S. (tight)
20' 5 clayey S. & some G.
S.S. (pervious)
S.S. (pervious)
El. Gr. Water 181.7
35' 1-4-5 & S
(questionable)
40' 1-2 G. & C.
S.S. (pervious)
45' 3-5 S.
D.S. (pervious)
50' 3-4 S
D.S. (tight)
60' 1-2-5 S (much C.)
D.S.
slightly pervious
70' 2-4 S. & some C.
75' 2-4-5
El. 108.7
80.5' Serpentine
Core 1 3/8"
Serpentine
121.5' Core
100.5'
El. 118.7
Core 1 3/8"
Boulders
6' 4-5 S.
Boulders
El. Lake Surface 203.
14' 1-5 S. & G.
20' 2-5 S. & G.
25' 3-6 G.
30' 8 sandy C.
S.S. (tight)
El. Gr. Water 176.1
D.S. (tight)
40' 4-5 S. & G.
S.S. (pervious)
58' 7-4 clayey S.
64' 2-3 G. & S.
Boulder
72' 3-4-5 S
80' 2-4 S.
S.S. (pervious)
S.S. (tight)
90' 5-7 S. & C.
clay
112'
Serpentine
Core recov.
122.15'
El. 93.85
Core 1 3/8"
El. Lake surface 203.2
Dec. 18-1911
SOUTH DIKE (Looking south)
14/C132




#21/C132
Sur El 224.2
ELEV
220
200
180
160
140
120
100
El Gr. Water 177.2
El. 117.2
Core T 3/8"
SOUTH D
(Continued)
To be combined with A

132
r. El 243.6

ELEV.

240

C.G.&S.

C.&*1-*2G.

Sandy C.

220

ELGr. Water 207.6

Sandy C & S

Sandy C & G

200

*4-*6 S. with C.

*4-*6 S. with some C.

180

*4-*6 S with trace C.

3-. G.&C.

*3-*6 S (above B)

*3-*4 S (below B)

160

*3-*5 S.

*6-*3 S.

*1-*3 G.&S. with some *4-*6 S.&C.

*2-*5 S.&G.

Serpentine wash

145.6

140

D.S. = Dry sample
W.S. = Wash sample

120

100

80

DIKE (looking south)

Ecc. C.5196

El 212.3 — 16' Altered Serpentine

El 212.3 — El Lone Surface 203.2 (6

200

180

160

140

120

100

NORT
(PROF

Samples indicated on right of holes
and for determining porosity of the
reliable than the dry and settled sam
left of holes. (Hole 3A shows all sampl

D.S. = Dry sample
S.S. = Settled sample

NORTH DI
(PROFILE G

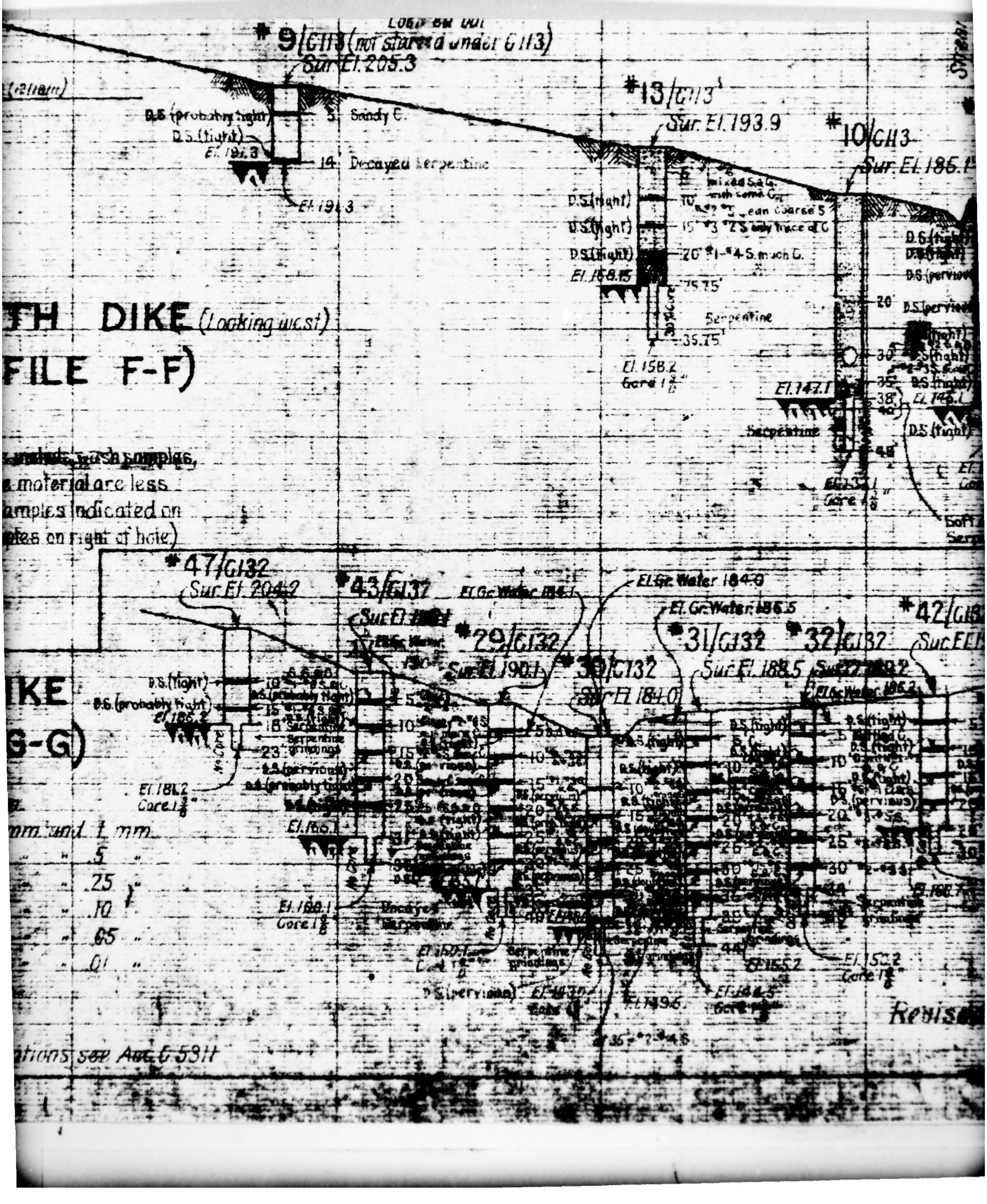
		*1 Coarse Gravel	Size above 5 mm
		*2 Fine Gravel	" between 5 m
Clay	= C	*3 Coarse Sand	" " 1
Sand	= S	*4 Medium Sand	" " .5
Boulders	= B	*5 Fine Sand	" " .25
Gravel	= G	*6 Superfine Sand	" " .10
		*7 Rock flour and clay	" " .05

Drawn CMC
Traced CMC
Checked [illegible]

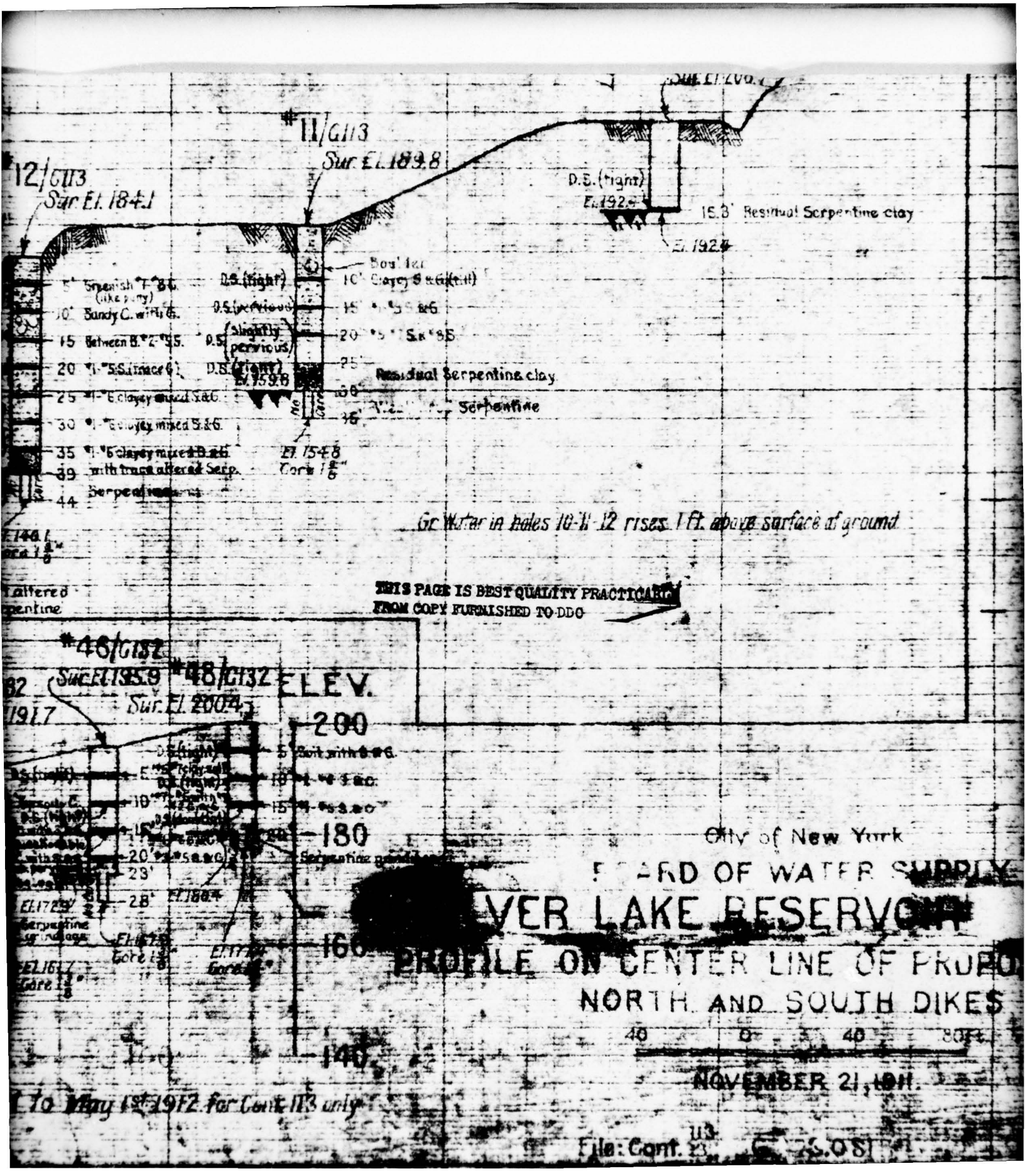
Formation determined by JPR.

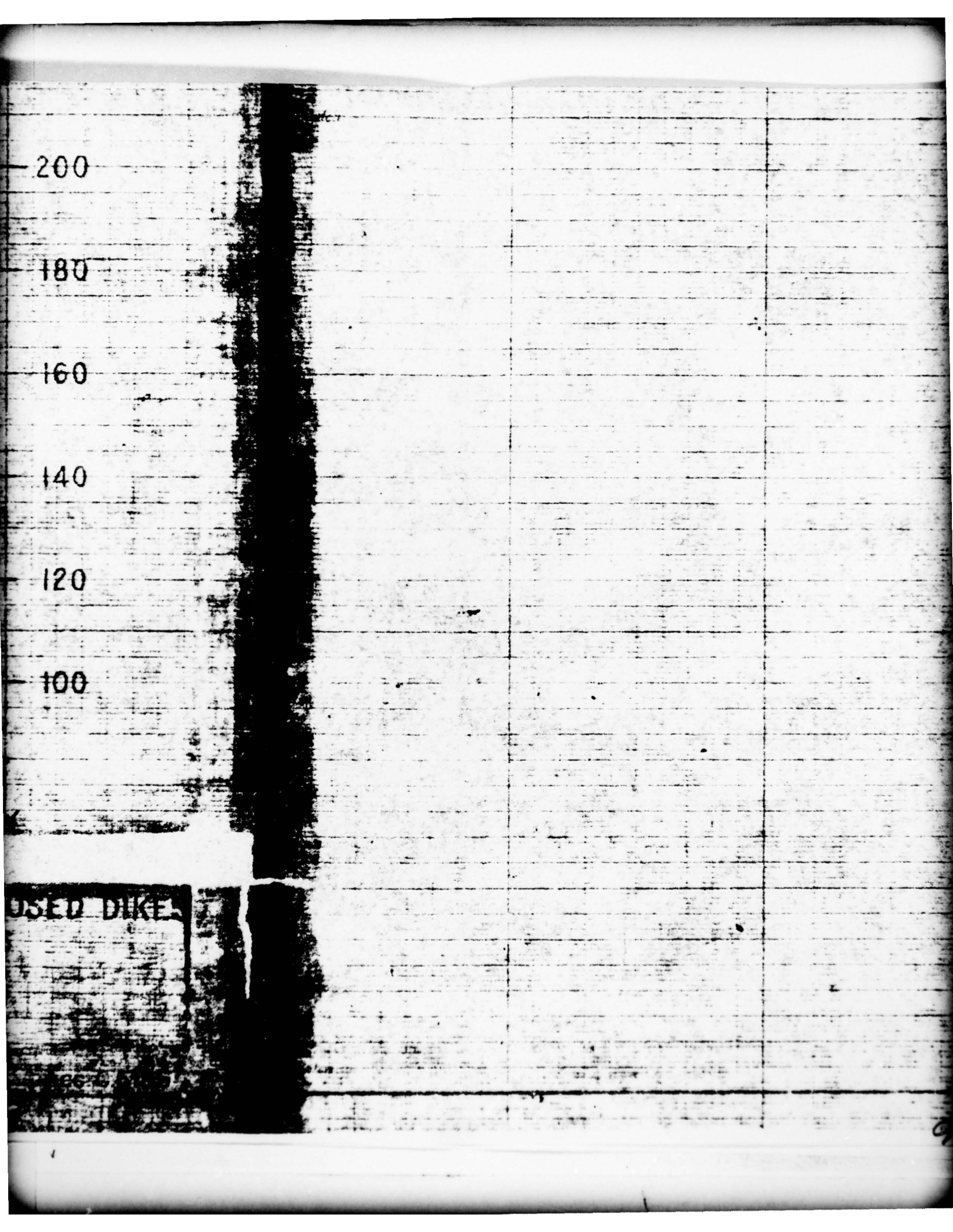
For plan loca

6



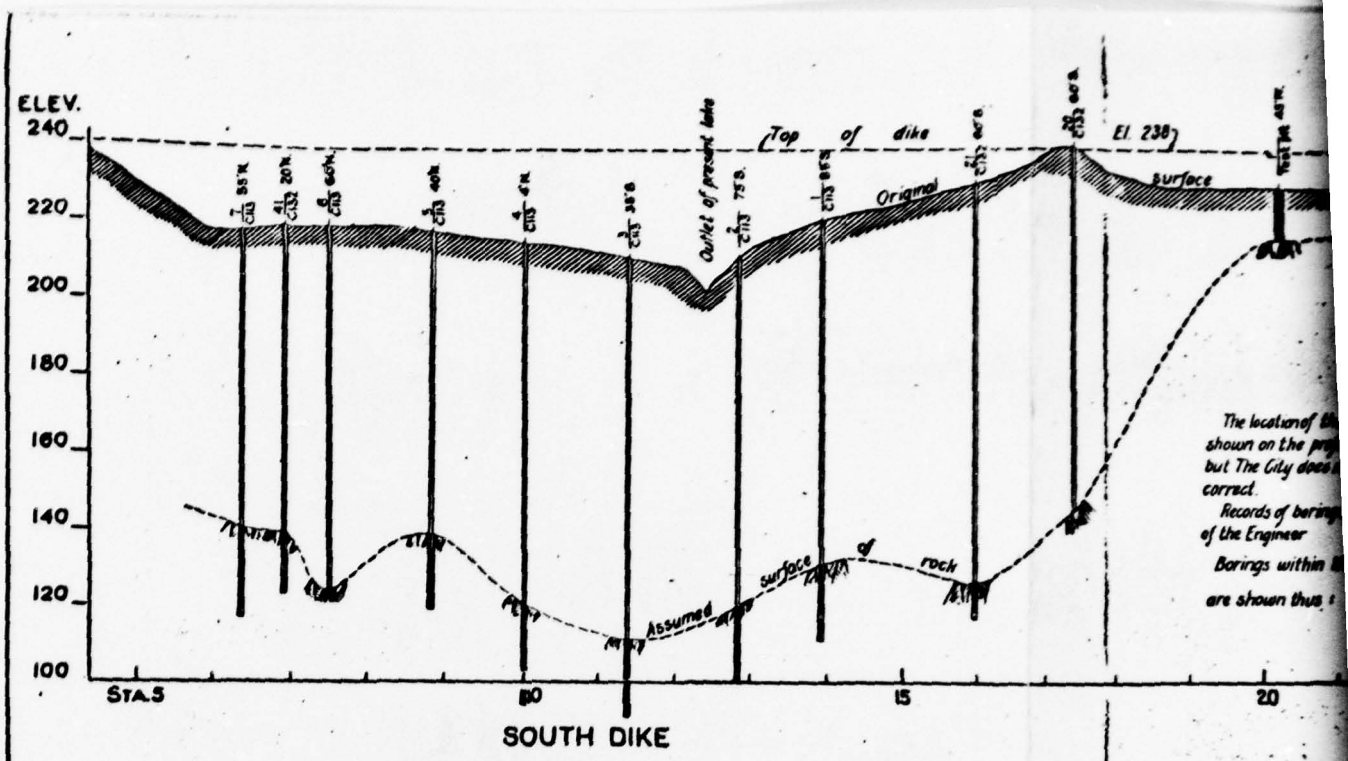
*9/G113 (not starred under G113)
Sur. El. 205.3
D.S. (probably tight)
D.S. (tight)
El. 191.3
Sandy G.
Decayed Serpentine
*13/G113
Sur. El. 193.9
El. 168.15
Serpentine
35.75'
El. 158.2
Core 1 3/8"
*10/G113
Sur. El. 185.1
El. 147.1
Serpentine
TH DIKE (Looking west)
FILE F-F)
material are less
amples indicated on
ples on right of hole)
*47/G132
Sur. El. 204.2
*43/G132
*29/G132
Sur. El. 190.1
*30/G132
Sur. El. 184.0
*31/G132
Sur. El. 188.5
*32/G132
*42/G132
El. Gr. Water 184.0
El. Gr. Water 186.5
IKE
G-G)
Serpentine grindings
El. 181.2
Core 1 3/8"
El. 160.1
El. 160.1
Core 1 3/8"
Decayed Serpentine
mm and 1 mm
.5
.25
.10
.05
.01
El. 149.6
El. 155.2
Revis
ations see Acc. G 5311

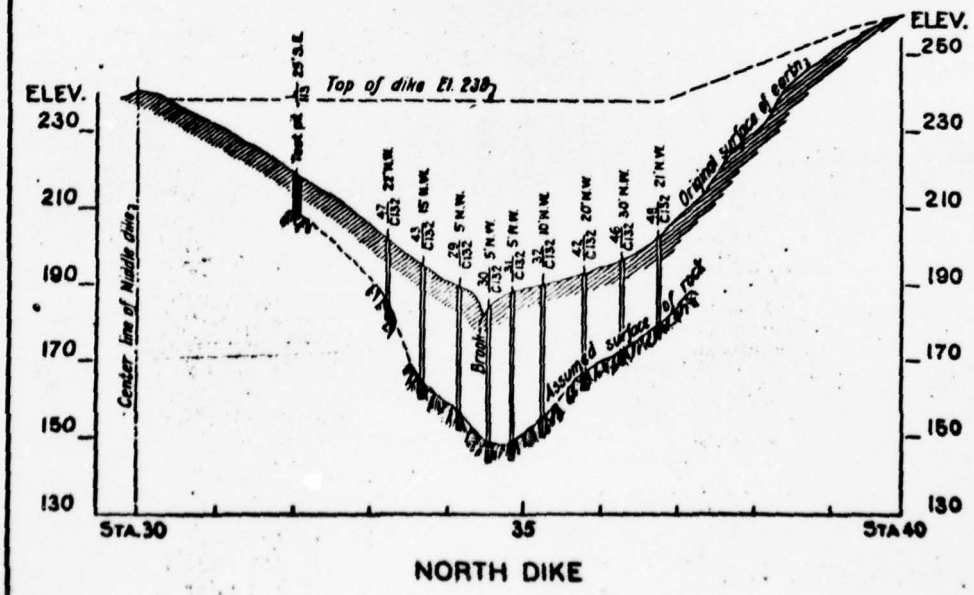

#11/C113
Sur. El. 189.8
12/C113
Sur El. 184.1
D.S. (right)
El. 192.4
15.3' Residual Serpentine clay
El. 192.4
Boulder
Residual Serpentine clay
Serpentine
El. 154.8
Core 1 5/8"
Gr. Water in holes 10-11-12 rises 1 ft. above surface of ground
THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC
#46/C132
Sur. El. 195.9
#48/C132
Sur. El. 200.4
ELEV.
200
180
160
140
City of New York
BOARD OF WATER SUPPLY
VER LAKE RESERVOIR
PROFILE ON CENTER LINE OF PROPO
NORTH AND SOUTH DIKES
40 0 40 80 Ft.
NOVEMBER 21, 1911.
to May 1st 1912 for Cont. 113 only
File: Cont. 113
S.O.S.

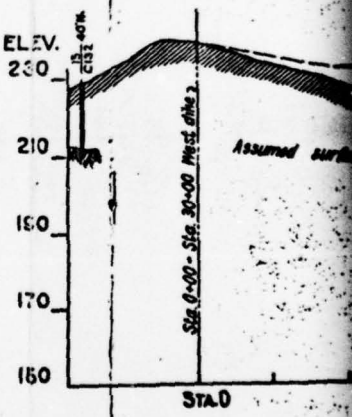

200
180
160
140
120
100
OSED DIKE

#1	Coarse Gravel	Size above	5 m.m.
#2	Fine Gravel	" between	5 " and 1 m.m.
#3	Coarse Sand	" "	1 " " .5 "
#4	Medium Sand	" "	.5 " " .25 "
#5	Fine Sand	" "	.25 " " .10 "
#6	Super fine Sand	" "	.10 " " .05 "
#7	Rock flour and clay	" "	.05 " " .01 "

Acc. To be examined with G.S. 96



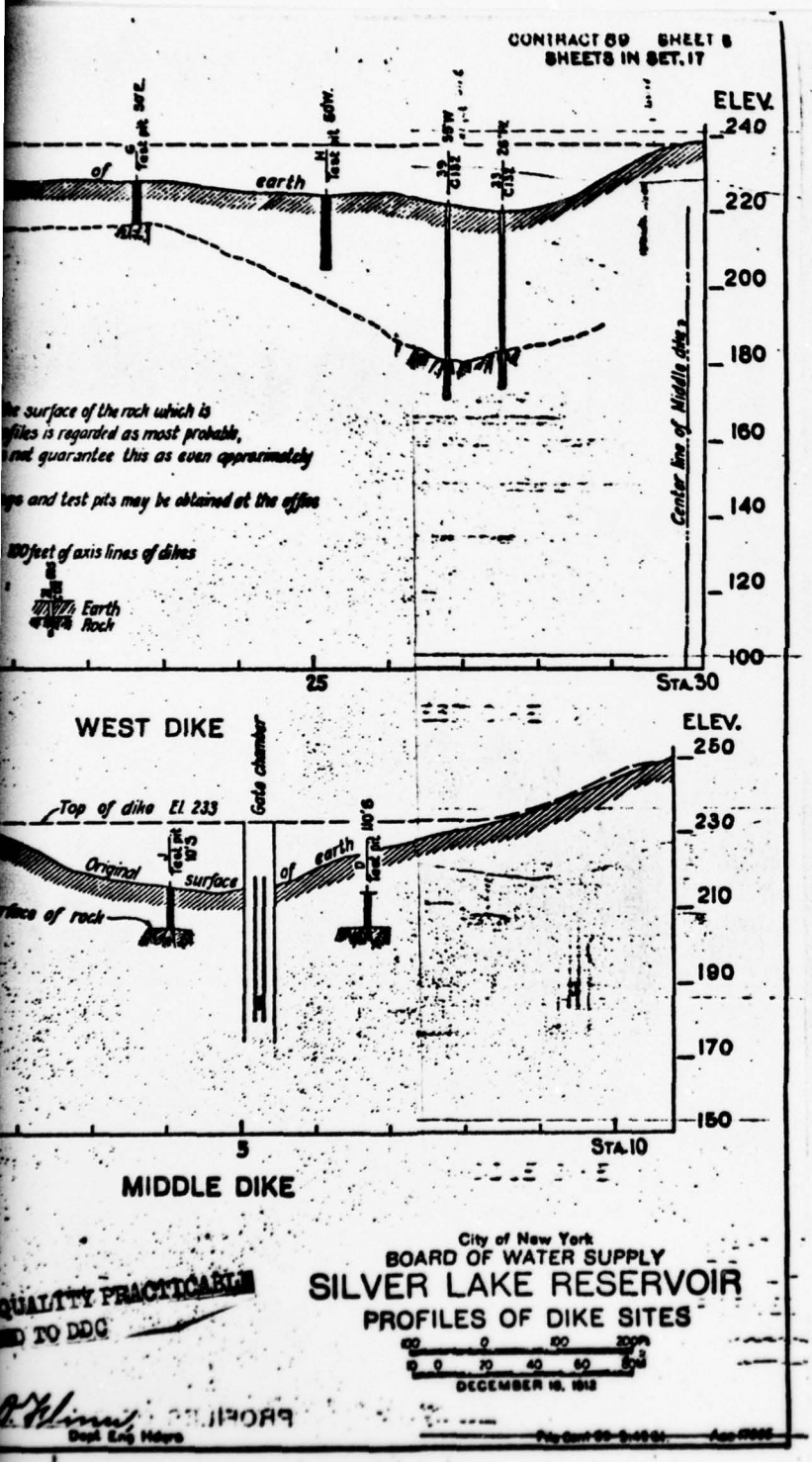




Fred. F. Morse
Designing Eng.

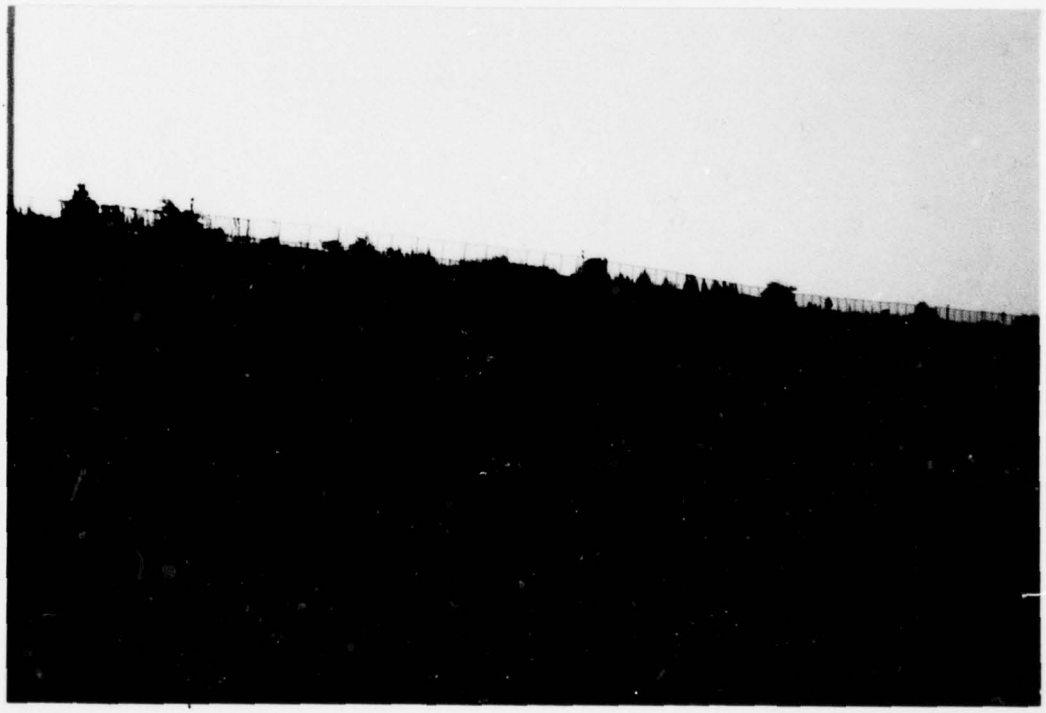
TYPICAL SECTIONS OF EMBANKMENTS

Alfredt


CONTRACT 69 SHEET 6
SHEETS IN SET, 17
ELEV.
240
220
200
180
160
140
120
100
earth
Center line of Middle dike
25
STA. 30
WEST DIKE
ELEV.
250
230
210
190
170
150
Top of dike El 233
Gate chamber
Original surface
of earth
5
STA. 10
MIDDLE DIKE
Earth
Rock
City of New York
BOARD OF WATER SUPPLY
SILVER LAKE RESERVOIR
PROFILES OF DIKE SITES
DECEMBER 16, 1913

PHOTOGRAPHS

APPENDIX B



DOWNSTREAM SLOPE OF NORTH DIKE, LOOKING SOUTH

UPSTREAM SLOPE OF NORTH DIKE,
LOOKING NORTH

WET AREA AT BERM LEVEL (EL 218±)
OF NORTH DIKE

DOWNSTREAM SLOPE OF WEST DIKE, LOOKING SOUTH

DOWNSTREAM SLOPE OF SOUTH DIKE, LOOKING EAST.
CREST IS NOT VISIBLE; FLAT AREA IS BERM AT EL 218±

NORTHWEST FACE OF MIDDLE DIKE, LOOKING
EAST AT NORTH GATE HOUSE FROM WEST END OF DIKE

DIFFERENTIAL SETTLEMENT OF FACING SLABS
ON NORTHWEST FACE OF MIDDLE DIKE

AD-A064 338 TIPPETTS-ABBETT-MCCARTHY-STRATTON NEW YORK F/G 13/2
NATIONAL DAM SAFETY PROGRAM. SILVER LAKE RESERVOIR INVENTORY NU--ETC(U)
OCT 78 E O'BRIEN DACW51-78-C-0024

UNCLASSIFIED NL

2 OF 2
AD A064338

END
DATE FILMED
4-79
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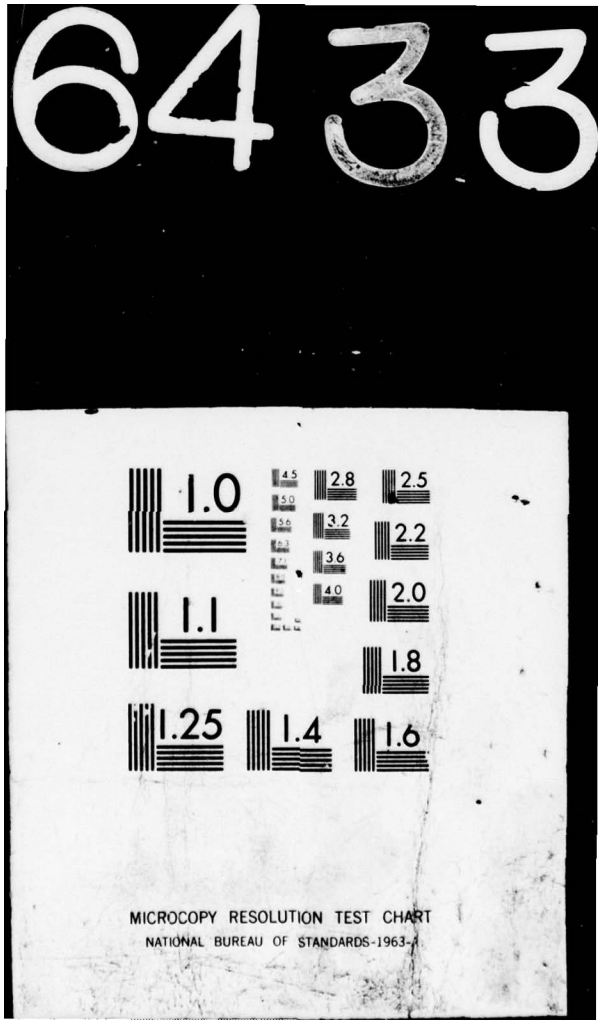
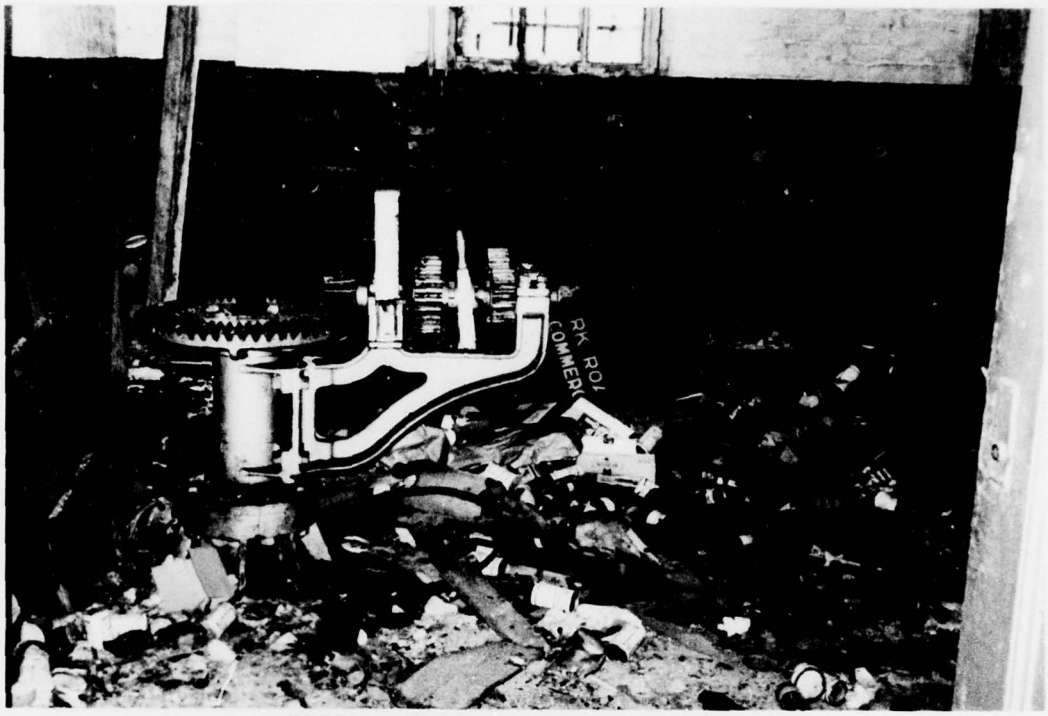
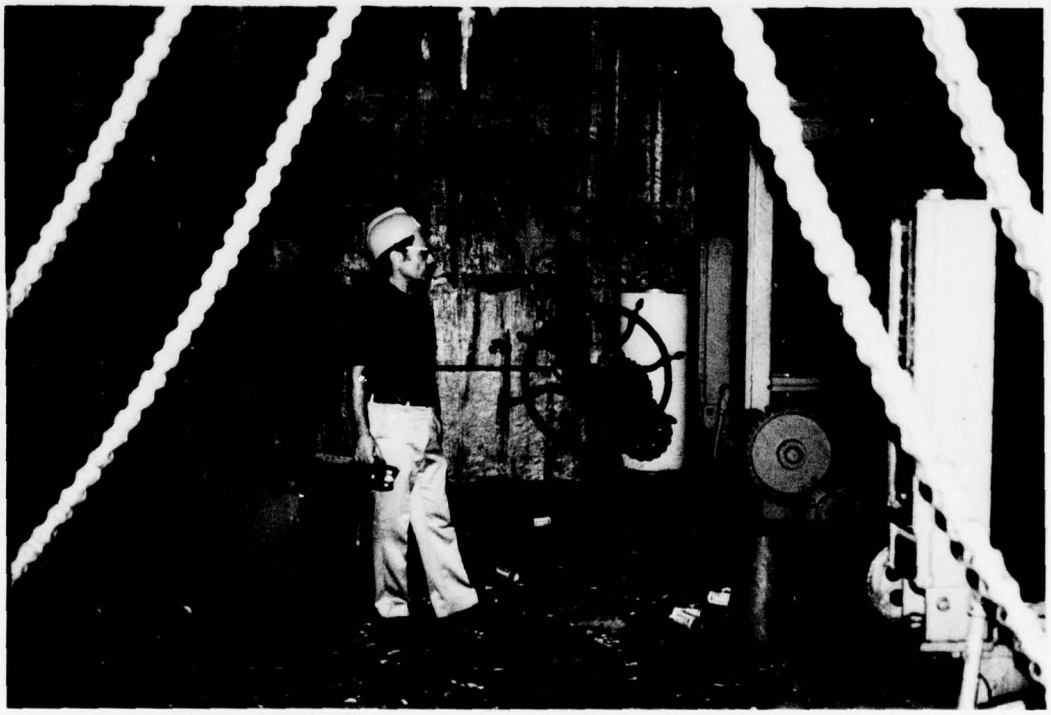
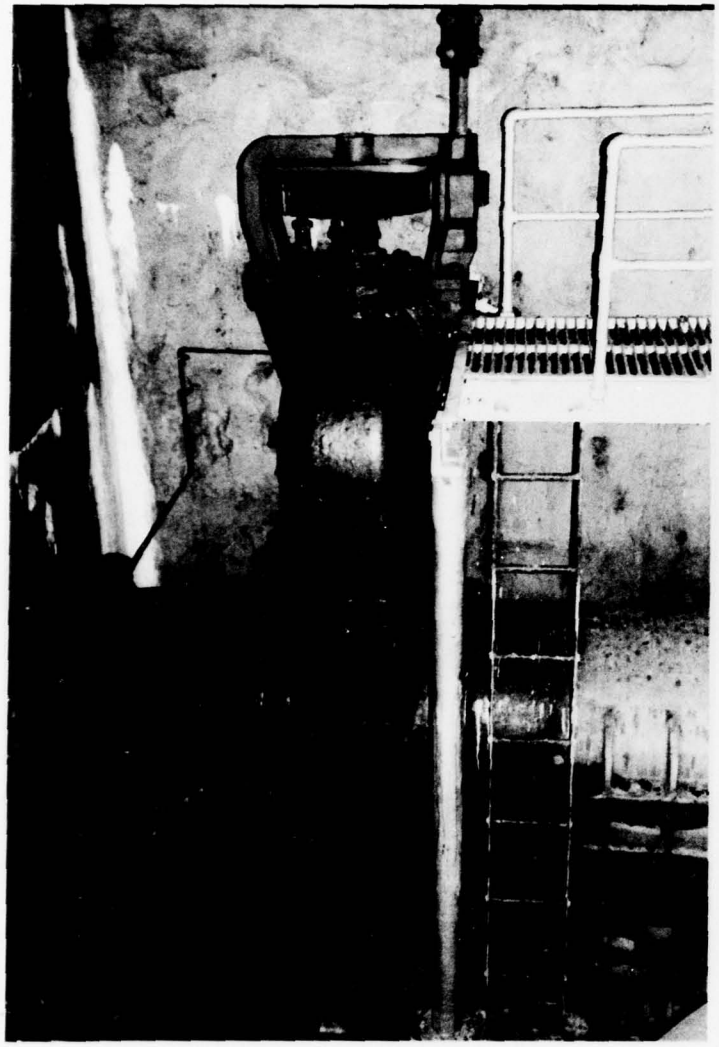

6433
1.0
1.1
1.25
1.4
1.6
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.8
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A



GATE OPERATING STAND FOR SOUTH
BLOW-OFF SLUICE GATE



GATE OPERATING CHAMBER; LOOKING WESTERLY.
GATE OPERATING STAND FOR NORTH BLOW-OFF.
GATE VALVE AT CENTER OF PHOTO.



SOUTH BLOW-OFF GATE VALVE, LOCATED IN VALVE CHAMBER

CORRODED TIE RODS (TYPICAL) CONNECTING CONDUIT TO 48 INCH CAST IRON MANIFOLD

ENGINEERING DATA CHECKLIST

APPENDIX C

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM SILVER LAKE DAM

ID # 60

ITEM	REMARKS
AS-BUILT DRAWINGS	SEE DRAWING LIST
REGIONAL VICINITY MAP	USGS MAPS : NARROWS, NEW YORK & JERSEY CITY, NEW JERSEY
CONSTRUCTION HISTORY	Contractor Name : Brief construction history is in BOWS Annual reports of 1914, 1915 & 1916.
TYPICAL SECTIONS OF DAM	SEE Drawing list.
OUTLETS-PLAN	SEE Drawing list.
-DETAILS	SEE Drawing list.
-CONSTRAINTS	
-DISCHARGE RATINGS	
RAINFALL/RESERVOIR RECORDS	Reservoir Records prior to 1971 is available in Staten Island office of BOWS.

ITEM	REMARKS
DESIGN REPORTS	None available
GEOLOGY REPORTS	None available
DESIGN COMPUTATIONS	None
HYDROLOGY & HYDRAULICS	None
DAM STABILITY	None
SEEPAGE STUDIES	None
MATERIALS INVESTIGATIONS	No Data Available
BORING RECORDS	
LABORATORY	
FIELD	
POST-CONSTRUCTION SURVEYS OF DAM	No post-construction surveys of Dam
BORROW SOURCES	No Data available

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	None
HIGH POOL RECORDS	Available in Staten Island office of BOWS
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None recorded or reported
MAINTENANCE OPERATION RECORDS	After 1971 no maintenance done in Gate House, therefore no maintenance operation records

ITEM	REMARKS
SPILLWAY PLAN	SEE DRAWING LIST
SECTIONS	
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	One drawing shows the operating equipment plan & details See drawing list.

VISUAL INSPECTION CHECKLIST

APPENDIX D

VISUAL INSPECTION CHECKLIST

1. **Basic Data**

a. General

Name of Dam SILVER LAKE RESERVOIR DAM Hazard Category HIGH

County RICHMOND ID# 60

Stream Name Unnamed Tributary of ———

Location 2 mi. S. of St George Ferry County Nearest Town (P.O.) West New Brighton Staten Island

Longitude ——— Latitude ——— Other Directions ———

West of Victory Blvd in Silver Lake Park

Date of Insp 8.17.78 Weather Clear, Hot Temperature 92°F Max

b. Inspection Personnel TAMS personnel:

A. Jezierski, Head TAMS Water Resources Div

A. Dolcimascolo, Dam Insp. Coordinator

J. Patel, Geotech. Engineer

c. Persons Contacted Mr. Massacappa, NYC BOWS

d. History: Date Constructed Completed 1917

Present Owner New York City, BOWS

Designed by N.Y.C. BOWS

Constructed by Beaver Eng. & Contract.

Recent History Put out of service 1971

2. **Technical Data**

Type of Dam Zoned Earth Dam Drainage Area ——— Acres

Height N. Dike 55' at ℄ W. Dike 18' S. Dike 35' Length N. Dike 1000' W. Dike 1400' S. Dike 1200'

Upstream Slope * ——— Downstream Slope * ———

Crest Width 42'-45' min Freeboard at Spillway Crest 10 ft

*	U/S	D/S Above El 218	D/S Below El 218
North Dike	1 on 3	1 on 3	1 on 3
West Dike	1 on 3	1 on 5 to 6	
South Dike	1 on 3	1 on 2	1 on 3
Middle Dike	1 on 1.75	1.0 on 1.75	

Low Level Control: (Type and Size) Blow-offs 2-36" Gate valves 2-30"x42" Sluice Gate; Reservoir Maintenance 5-48" gate valves 2-3'x5" Sluice Gates

Valve Condition Fair; Out of service since 1971

~~Emergency~~ Spillway Type (Material) Concrete Weir Width 2 x 85"

Side Slopes —

Height (Crest to Top) —

Exit Slope —

Exit Length —

Ponded Surface Area 57.4 Acres

Capacity (Normal Level) 1416 Acre Feet

Capacity Emergency Spillway Level ___ Acre Feet

3. Embankment

There are 4 dikes: ① North Dike ② West Dike ③ South Dike ④ Middle Dike

a. Crest Approx 44' w. 24' roadway for ①②③; 30' for ④

(1) Vertical Alignment For the most part at El 238
No evidence of settlement

(2) Horizontal Alignment Curved & irregular; no evidence of horizontal movement.

(3) Longitudinal Surface Cracks None visible on embankment; som minor cracks on roadway - not related to dam movement

(4) Transverse Surface Cracks Same as (3) above

(5) General Condition of Surface Generally good; Crest of ①②③ contains 24' wide pavement Crest of ④ contains 16' wide Pavement

(6) Miscellaneous

b. Upstream Slope

(1) Undesirable Growth or Debris Except for middle dike, there is heavy growth of brush, trees, saplings on U/s slopes above riprap, Esp. N. part of ①

(2) Sloughing, Subsidence, or Depressions None visible, except at one location where disturbance of riprap appears result of vandalism

(3) Slope Protection 1.5'-0.5' stone riprap below El 233± on ① ② & ③; 8.5' wide concrete panels on ④; Conc. is 8" thick

(a) Condition of Riprap In good condition

(b) Durability of Individual Stones Good

(c) Adequacy of Slope Protection Against Waves and Runoff
Adequate

(d) Gradation of Slope Protection - Localized Areas of Fine Material
Relatively uniform 1.5' max size
0.5' minimum size

(4) Surface Cracks Conc. slabs on ④ are cracked with brush and small saplings growing from cracks; some differen. settlement of slabs. 1"-2"

c. Downstream Slope

(1) Undesirable Growth or Debris None on N. Dike; Row of planted trees (1.5-2.0' dia) spaced ovt on W. Dike; heavy brush, trees above El 218 berm on S. Dike

(2) Sloughing, Subsidence, or Depressions; Abnormal Bulges or Non-Uniformity

None visible

(3) Surface Cracks on Face of Slope None visible

(4) Surface Cracks or Evidence of Heaving at Embankment Toe

None visible

(5) Wet of Saturated Areas or Other Evidence of Seepage on Face of Slope; Evidence of "Piping" or "Boils"

Wet soggy area at berm level (El 218±) on N. Dike at N. third point. Area is 25-30 in extent - no seepage visible

(6) Fill Contact with Outlet Structure

No erosion or other problems visible

(7) Condition of Grass Slope Protection Except for S. Dike above El 218, grass slope on D/S slope well maintained by Parks Dept. as part of golf course

d. Abutments

(1) Erosion of Contact of Embankment with Abutment from Surface Water Runoff, Upstream or Downstream

None visible

(2) Springs or Indications of Seepage Along Contact of Embankment with the Abutments

None visible

(3) Springs or Indications of Seepage in Areas a Short Distance Downstream of Embankment - Abutment Tie-in

Wet areas approx 300± ft D/S of Crest, just below toe; apparently an old spring which was noted on preconst topo. - no seepage

e. Area Downstream of Embankment, Including Tailrace Channel

(1) Localized Subsidence, Depressions, Sinkholes, Etc.

Non visible

(2) Evidence of "Piping" or "Boils" None visible

(3) Unusual Presence of Lush Growth, such as Swamp Grass, etc.

Only near springs D/S of toe

(4) Unusual Muddy Water in Downstream Channel

None visible

(5) Sloughing or Erosion None visible

(6) Surface Cracks or Evidence of Heaving Beyond Embankment, Toe

None visible

(7) Stability of Tailrace Channel Sideslopes Not Applicable

(8) Condition of Tailrace Channel Riprap
Not Applicable

(9) Adequacy of Slope Protection Against Waves, Currents and Surface Runoff
Not applicable

(10) Miscellaneous

f. Drainage System No drains in embankment dam

(1) Condition of Relief Wells, Drains and Appurtenances
No drains in dam

(2) Unusual Increase or Decrease in Discharge from Relief Wells

4. Instrumentation
No instrumentation for embankments

(1) Monumentation/Surveys None

(2) Observation Wells None

(3) Weirs None

(4) Piezometers None

(Other)

5. Reservoir

a. Slopes No evidence of distress or other problems; Reservoir riprapped on east rim...; Riprap is 4' max hand placed on east rim. Not part of original construction.

b. Sedimentation Not measured; no info available

6. Spillways Two 85" x 17" concrete weirs at gate house; one drains S. pool; other, N. pool

a. ~~Principal Spillway: Inlet Condition~~ Weir El 228

~~Pipe Condition~~

General Remarks (include information such as recently repaired, potential for debris accumulation, special items of note, etc.)

Only N. Weir could be inspected. Weir flow falls into 85" x 4' x 4' chamber with 32"-33" inch diameter overflow well which leads to 3' x 2.5' blow-off drain to sewer at El 185.0

b. ~~Emergency~~ Spillway: General Condition Structurally good

N. Weir chamber filled with debris by vandals

Tree Growth Not Applicable

Erosion Not applicable

Other Observations Metal grate covers overflow well.

7. Structural (if required) See Attached Appendix

8. Downstream Channel

Not applicable

a. Condition (obstructions, debris, etc.)

Not applicable

b. Slopes Not applicable

c. Approximate No. Homes and Population Golf course immediately D/S of toe; thereafter heavily populated section of Italian Island

d. General

A. Dolamasco

TEAM CAPTAIN

STRUCTURAL INSPECTION CHECKLIST

PHASE I DAM INSPECTION

1. Concrete Surfaces Concrete surfaces in gatehouse generally Good

2. Structural Cracking Middle dike concrete facing slabs cracked at many locations. Of little consequence

3. Movement - Horizontal and Vertical Alignment

4. Junctions with Abutments or Embankments Junction between Gatehouse and Middle Dike appears to be good

5. Drains - Foundation, Joint, Face None

6. Water Passages, Conduits, Sluices Except for N. Weir chamber, waterpassages not inspected

7. Seepage or Leakage None visible.

8. Monolith Joints - Construction Joints None visible

9. Foundation

10. Abutments

11. Control Gates Gate supports are in good condition

12. Approach and Outlet Channels

13. Stilling Basin

14. Intake Structure

15. Settlement None

16. Stability
    a. Overturning
    b. Sliding
    c. Seismic

17. Instrumentation
    a. Alignment
    b. Uplift
    c. Seismic

18. Miscellaneous

HYDROLOGIC DATA AND COMPUTATIONS

APPENDIX E

TAMS

Job No. 1487-12 Sheet ____ of ____
Project SILVER LAKE DAM Date 091678
Subject SAFETY INSPECTION By CV
Ch'k. by ____

- TOTAL SPILLWAY CREST LENGTH $2 \times 85'' = 170'' \rightarrow 14.17'$

SINCE TRAPEZOIDAL SIDES ARE ALMOST VERTICAL ASSUME BROAD CRESTED WEIR C COEFFICIENT FOR 1.5' BREADTH APPLICABLE (KING'S TABLE 47)

EL	H	C	$Q = 14.17 C H^{3/2}$ (cfs)	MAX H = 1.5'
229.3	0			
230	0.7	2.72	22.6	
233	3.7	3.32	334.8	NOT APPLICABLE
238	7.7	3.32	1005.0	" "

ORIFICE FLOW FOR $H > 1.5$ THROUGH 2 RECTANGULAR OPENINGS (TOTAL $1.5 \times 14.17'$)

$Q = \frac{2}{3}(14.17)\sqrt{2g}\left(h_2^{3/2} - h_1^{3/2}\right)$

EL	h_2 = EL − 229.3	h_1 = EL − 230.8	
233	3.7	2.2	292.2
238	8.7	7.2	480.7

AREA OF 2 33"ϕ OVERFLOW WELLS

$2\left[\frac{33}{12} \cdot \frac{1}{2}\right]^2 \pi = 11.88 \text{ ft}^2$

APPROX. AREA OF SINGLE HORSE-SHOE DRAIN

$\frac{1}{2}\left[\frac{2.5}{2}\right]^2 \pi = 2.45$

$\left(3 - \frac{2.5}{2}\right)(2.5 - .25) = 3.94$

$6.39 < 11.88$

E1

TAMS

Job No. 1487-12 Sheet ____ of ____

Project SILVER LAKE DAM Date 091878

Subject SAFETY INSPECTION By CJV

Ch'k. by ____

ASSUME 3' x 2.5' HORSESHOE DRAIN IS EQUIVALENT TO 34" ϕ CONC. PIPE 2800' LONG. FOR FULL FLOW

OUTLET INV. $184.0 - 2800(0.001) = 181.2$

HEAD H = LAKE EL. $- (181.2 + 3.0(0.85))$
= LAKE EL $- 183.75$

$$H = \left[\frac{2.5204\,(1+0.5)}{\left(\frac{34}{12}\right)^4} + \frac{466.18\,(0.013)^2(2800)}{\left(\frac{34}{12}\right)^{16/3}} \right] \frac{Q^2}{10^2}$$

OR $$Q = \sqrt{\frac{100\,H}{0.91244}}$$

EL	H	Q
229.3	45.55	70.65
230	46.25	71.20
233	49.25	73.47
238	54.25	77.11

E 2